

CA20N  
EAB  
-0 53

EA-90-01

# ENVIRONMENTAL ASSESSMENT BOARD



## ONTARIO HYDRO DEMAND/SUPPLY PLAN HEARINGS

---

VOLUME: 3

DATE: Wednesday, April 24, 1991

BEFORE:

HON. MR. JUSTICE E. SAUNDERS CHAIRMAN

DR. G. CONNELL MEMBER

MS. G. PATTERSON MEMBER

---

**EARR**  
ASSOCIATES &  
REPORTING INC.

(416) 482-3277

2300 Yonge St., Suite 709, Toronto, Canada M4P 1E4



ENVIRONMENTAL ASSESSMENT BOARD  
ONTARIO HYDRO DEMAND/SUPPLY PLAN HEARING

IN THE MATTER OF the Environmental Assessment Act,  
R.S.O. 1980, c. 140, as amended, and Regulations  
thereunder;

AND IN THE MATTER OF an undertaking by Ontario Hydro  
consisting of a program in respect of activities  
associated with meeting future electricity  
requirements in Ontario.

Held on the 5th Floor, 2200  
Yonge Street, Toronto, Ontario,  
on Wednesday, the 24th day of April,  
1991, commencing at 10:00 a.m.

-----  
VOLUME 3  
-----

B E F O R E :

THE HON. MR. JUSTICE E. SAUNDERS	Chairman
DR. G. CONNELL	Member
MS. G. PATTERSON	Member

S T A F F :

MR. M. HARPUR	Board Counsel
MR. R. NUNN	Counsel/Manager, Informations Systems
MS. C. MARTIN	Administrative Coordinator
MS. G. MORRISON	Executive Coordinator



A P P E A R A N C E S

B. CAMPBELL	)	
M. PAYNE	)	Ontario Hydro
F. BARNETT	)	
J.C. SHEPHERD	)	IPPSO
I. MONDROW	)	
R. WATSON	)	Municipal Electric
M. MARK	)	Association
S. COUBAN		Provincial Government Agencies
C. MARLATT	)	NORTH SHORE TRIBAL COUNCIL UNION OF ONTARIO INDIANS UNITED CHIEFS AND COUNCILS OF MANITOULIN WHITEFISH RIVER FIRST NATION
D. POCH	)	COALITION OF ENVIRONMENTAL
D. STARKMAN	)	GROUPS
D. ARGUE	)	
H. POCH		CITY OF TORONTO
C. SPOEL	)	VOICE OF WOMEN
S. THOMPSON		ONTARIO FEDERATION OF AGRICULTURE



A P P E A R A N C E S  
(Cont'd)


B. KELSEY	)	NORTHWATCH
L. GREENSPOON	)	
J. M. RODGER	)	AMPCO
N. KLEER	)	NAN TREATY #3, et al
T. HILL		TOWN OF NEWCASTLE
B. BODNAR		CONSUMERS GAS
G. GRENVILLE-WOOD		SESCI
E. LOCKERBY		AECL
B. ALLISON		OMAA
C. GATES	)	CAC (ONTARIO)
J. MONGER	)	
A. CONNOR		DOFASCO
F. MACKESY		ON HER OWN BEHALF
R. HUNTER		ON HIS OWN BEHALF
S. QUIGLEY		
C. CARTER		
L. HIGGINS		
M. VERWEGEN		
L. MURPHY		
D. MERRIMAN		
R. CHUTZ		



I N D E X   o f   P R O C E E D I N G S

Page No.

<u>MITCHELL PIERSON ROTHMAN,</u>	
<u>PAUL JONATHAN BURKE,</u>	
<u>LILY BUJA-BIJUNAS; Resumed</u>	404
Direct Examination by Mr. B. Campbell (cont'd)	404
Cross-Examination by Mr. Rodger	512



Digitized by the Internet Archive  
in 2022 with funding from  
University of Toronto

<https://archive.org/details/31761114681364>

1       ---Upon commencing at 10:01 a.m.

2                   THE REGISTRAR: This hearing is again in  
3 session. Please be seated.

4                   THE CHAIRMAN: Mr. Mark?

5                   MR. MARK: Good morning, Mr. Chairman.  
6 Before we resume with the examination, there is one  
7 matter I could speak to.

8                   I have been discussing with some of the  
9 other counsel for the intervenors some of the  
10 logistical issues associated with cross-examination.  
11 And there has already been some discussion with Ms.  
12 Morrison.

13                   And we were advised that the Board's  
14 preference is that during cross-examination, counsel  
15 stand and use the lecturn. Our preference, frankly,  
16 based upon our experience in similar forum, is to, in  
17 fact, use a table and be seated for the following  
18 reasons.

19                   THE CHAIRMAN: Well, now, just a moment,  
20 don't go into this in great. That may be okay. If  
21 that is the way you think it works well and everyone  
22 else thinks it works well, I have no problem about  
23 that.

24                   MR. MARK: All right.

25                   THE CHAIRMAN: Where I come from, it is

1 customary for both the people who are questioning and  
2 the people who are being questioned to stand, but I  
3 recognize that is probably not convenient for the panel  
4 nor perhaps it isn't for the questioners.

5 MR. MARK: When I first came to these  
6 forums, I had the same impression, but I soon found the  
7 weight of the documents shortened your lifespan on your  
8 feet, so ...

9 THE CHAIRMAN: So, I take it the  
10 questioners, then, are sitting at a table with  
11 microphones?

12 MR. MARK: Yes.

13 THE CHAIRMAN: And that is just like a  
14 congressional hearing type of thing.

15 MR. MARK: What we would propose is to  
16 actually take one of the front tables and turn it  
17 lengthwise so that you are facing the witnesses.

18 One finds that with the number of binders  
19 of documents that we consistently have reference to,  
20 and because we do consult with our advisors during the  
21 course of cross-examination; otherwise, it would be  
22 almost impossible to deal with.

23 So, unless you have any objection, we  
24 would like to turn one of the tables lengthwise and  
25 proceed from there.

1 THE CHAIRMAN: Well, I don't have any  
2 objection to it.

3 Ms. Morrison, does that cause any  
4 logistical problems to the arrangements?

5 MS. MORRISON: Well, we don't have any  
6 more table mikes, but if you could make do with the  
7 small one.

8 THE CHAIRMAN: Maybe we could get some,  
9 eventually.

10 MS. MORRISON: I will. I will get it  
11 this afternoon.

12 MR. MARK: Thank you.

13 THE CHAIRMAN: All right.

14 Just a moment, Mr. Campbell, I have got a  
15 couple of other things I just want to refer to.

16 It is expected, I understand, that the  
17 Ontario Hydro evidence on Panel 1 will be completed  
18 today and probably this morning. That will be followed  
19 by Mr. Rodger, on behalf of AMPCO, questioning the  
20 panel on economic issues only, as I understand it; is  
21 that correct?

22 MR. RODGER: Yes, that's correct, Mr.  
23 Chairman.

24 THE CHAIRMAN: I should say,  
25 parenthetically, that we can't worry too much about

1       this because we told the parties that the  
2       cross-examination wouldn't begin until Thursday.

3               So, Mr. Rodger, you will be continuing  
4       today. And I take it that when you are finished that,  
5       that there will be no further questioning today.

6               We will start tomorrow with Mr. Mark on  
7       behalf of the Municipal Electric Association; followed  
8       by Mr. Rodger to complete his examination; followed by  
9       Mr. Rogers for the Ontario Natural Gas Association and  
10      the Northwatch. His co-counsel will be doing the  
11      Northwatch.

12              And then, if there is still time left, I  
13      guess we start with the Coalition, and I take it that  
14      you would not, even on this schedule, be completing  
15      your cross-examination tomorrow. So there will be  
16      nobody after the Coalition tomorrow.

17              We then adjourn until Monday, which is  
18      the 29th, and that will start with the scoping sessions  
19      on Panel 2. It is expected but not -- there is a  
20      possibility, at least, that that session may be quite  
21      short; and if that does occur, then we will continue on  
22      Monday with the questioning of the Panel 1.

23              There was, as I announced yesterday, a  
24      motion scheduled for April 30th, but that motion has  
25      been adjourned to May 10th. So the hearing will

1 continue on April 30th and on May 1, but we will not  
2 not sit on May 2nd, as we previously told you, and, of  
3 course, May 3rd being a Friday, we won't be sitting  
4 either on that day.

5 So that is at the moment as we see the  
6 scheduling going into the end of next week.

7 Mr. Campbell?

8 Mr. Greenspoon?

9 MR. B. CAMPBELL: Well, I was going to  
10 speak to that. I think the --

11 THE CHAIRMAN: Wait. Hold it. Mr.  
12 Greenspoon is on his feet.

13 MR. B. CAMPBELL: Oh, I'm sorry.

14 THE CHAIRMAN: Sorry.

15 MR. GREENSPOON: I assume that it was a  
16 slip of the tongue when you said Northwatch. You meant  
17 North Channel Advocates?

18 THE CHAIRMAN: I certainly meant North  
19 Channel Advocates.

20 MR. B. CAMPBELL: In addition to that  
21 matter, given the scoping session on the 29th, just for  
22 the convenience of the panel, can we, at least, release  
23 the panel on Monday until, say, 11 o'clock, given that  
24 the scoping is for ten?

25 THE CHAIRMAN: Well, Monday is a long way

1 off. Can we discuss that informally? I don't think we  
2 need to deal with it as a formal matter.

3 MR. B. CAMPBELL: That is fine.

4 MITCHELL PIERSON ROTHMAN,  
5 PAUL JONATHAN BURKE,  
6 LILY BUJA-BIJUNAS; Resumed

7 DIRECT EXAMINATION BY MR. B. CAMPBELL (Cont'd):

8 Q. All right. Picking up then where we  
9 left off yesterday, Dr. Buja-Bijunas, I would ask you  
10 to give the key results for the industrial end-use  
11 analysis that you are responsible for.

12 THE CHAIRMAN: Just remind me what number  
13 on Exhibit 100 that is.

14 DR. BUJA-BIJUNAS: Okay. We are  
15 presently on chart No. 15 of Exhibit 100.

16 THE CHAIRMAN: Thank you.

17 DR. BIJA-BIJUNAS: What this chart does  
18 is it gives the forecast by industry for eight  
19 industries within the industrial sector. We actually  
20 analyse about 18 industries, but these are the eight  
21 largest.

22 What you will notice is that there is a  
23 clustering of four key industries in terms of  
24 electricity consumption. These are pulp and paper -  
25 the top line on the chart - industrial chemicals, iron  
and steel, and mining, which includes milling, smelting

1 and refining. These four key industries account for 60  
2 per cent of electricity consumption in the industrial  
3 sector.

4 The other four industries shown on this  
5 overhead include: The top most one is iron foundries,  
6 food and beverage, auto assembly, and non-metallic  
7 minerals, which includes things like glass production.

8 What I want to do is address only two of  
9 these industries and discuss a few of the assumptions  
10 that were used in producing the forecasts for these  
11 industries. And the first one I want to turn to is the  
12 pulp and paper industry. And that is chart No. 16 of  
13 the exhibit.

14 What this chart shows is the output  
15 growth of the pulp and paper industry over the forecast  
16 period. And by output growth, I am referring to  
17 production growth, tonnage growth of the various  
18 products produced by this industry.

19 The key output of the pulp and paper  
20 industry is newsprint production and it accounts for 49  
21 per cent of electricity consumption by the pulp and  
22 paper industry.

23 The next largest consumer is printing and  
24 writing paper, which accounts for about a quarter of  
25 the electricity used in the pulp and paper industry.

1                   Export or market pulp accounts for about  
2       7 per cent and the remaining products account for the  
3       residual electricity use.

4                   When I look at the factors affecting  
5       output growth in this industry, and I turn to  
6       newsprint, the issue of recycling must be considered in  
7       terms of impact on newsprint production.

8                   Ontario firms are expected to diversify  
9       into higher-valued grades of newspaper to compensate  
10      for market loss of cheaper grades to U.S. producers.

11                   We will be undoubtedly doing recycling,  
12      but at the same time, we recognize the fact that there  
13      are a number of companies starting up in the U.S. which  
14      are located close to their local markets and,  
15      therefore, have a cost advantage. They do not have to  
16      incur the large transportation costs that our mills,  
17      which are located in northern Ontario, would have to  
18      incur.

19                   The other thing to consider is that as  
20      you do recycling, you can only recycle newsprint a  
21      certain number of times before you do find yourself  
22      having to upgrade your input with good virgin fibre.

23

24

25

...

1 [10:13 a.m.] And Ontario industry has the good virgin  
2 fibre as a competitive advantage, so we will be  
3 uptaking recycling of newsprint, but not to a full  
4 extent.

5 Printing and writing paper, its output  
6 growth of 3.2 per cent, is quite strong, and it is the  
7 biggest area of growth. Also, there will be a tendency  
8 towards higher value paper grades.

9 One of the interesting aspects about  
10 printing and writing paper and its high growth rate, is  
11 a lot of our tendency toward an electronic information  
12 age has resulted in the use of more and more paper,  
13 which seems rather contradictory, that going to an  
14 electronic age has done this. But, in point of fact,  
15 you just have to look around the amount of computer  
16 printouts people are producing these days, and the  
17 number of documents revisions which result in paper  
18 being used over and over and over again.

19 Whereas, initially, one piece of paper  
20 with a lot of Snowpake would suffice. So in actual  
21 fact, we are actually seeing an increase in the amount  
22 of paper with PC use, et cetera.

23 Could I have the next chart, please?

24 So, I have discussed a bit about the  
25 outputs being produced by the pulp and paper industry.

1       What I want to do now is turn to the various  
2       technologies available, various processes used to  
3       produce the various products, and that is what this  
4       particular overhead shows.

5                   When I mentioned use of recycled fibre  
6       and newsprint production, not only does recycling  
7       impact the amount of newsprint you have to produce in  
8       the first place; in other words, it will have a  
9       downward push on your driver, when you use waste paper  
10      fibre as an input, it also has a impact on the  
11      processing energy, so that your forecast is impacted  
12      from both directions.

13                   If I turn to the sort of technologies  
14      that are in place to produce the various pulps and  
15      papers, there are two basic mechanical types of pulping  
16      operations, ground wood and TMP/CTMP. You will notice  
17      from the energy or the electricity intensities at 1,600  
18      and 2,500 kilowatthours per ton, these are very  
19      electricity intensive technologies. That is not  
20      surprising.

21                   Mechanical pulps basically tear apart  
22      wood fibres by using rotating grind stones. So you are  
23      tearing apart the fibre to release the fibre, and that  
24      requires very, very large motors, large mechanical  
25      drive and very large electricity use.

1                   If we turn to chemical pulps, they use  
2                   significantly less electricity, but they are much more  
3                   expensive to produce and are usually used for things  
4                   like very fine paper, strong paper construction.

5                   And finely recycled, you will notice,  
6                   uses 250 kilowatthours per ton. Obviously when you are  
7                   going to replace some mechanical pulp with recycled  
8                   pulp, there are significant energy savings associated  
9                   with that.

10                  Basically, in our forecast what we have  
11                  assumed is that we will go from a current newsprint  
12                  production, which basically is 58 per cent ground wood,  
13                  some TMP, some chemical, and about 9 per cent waste  
14                  fibre, to a newsprint production in the year 2015 with  
15                  no ground wood, that being phased out. One-third of  
16                  all newsprint production using recycling technology,  
17                  and all virgin based newsprint to be produced by either  
18                  TMP or CTMP.

19                  If I turn to fine paper, currently fine  
20                  paper has a very, very large chemical content. There  
21                  is no way you can really get around that, because of  
22                  the nature of fine paper. It is currently 20 per cent  
23                  ground wood, 80 per cent chemical, and our forecasts,  
24                  receiving by the end of the end forecast period, 20 per  
25                  cent of fine paper will have waste paper fibre

1 incorporated in it.

2 If you turn to the next chart, chart No.  
3 18, what this chart does is it illustrates the impact  
4 on the forecast of using these recycling technologies.  
5 This chart basically compares last year's 1989 pulp and  
6 paper forecast, which did not consider recycling, to  
7 the 1990 forecast which does consider recycling.

8 The net result is, whereas last year we  
9 had a 2.3 per cent growth in the pulp and paper  
10 industry, this year we are forecasting a 1.8 per cent  
11 growth in the pulp and paper industry.

12 MR. B. CAMPBELL: Q. I think you wanted  
13 then to turn to a discussion of the second major  
14 industry in the industrial area, that is iron and  
15 steel?

16 DR. BIJAS-BIJUNAS: A. If you would all  
17 turn to chart No. 19. This chart gives the output  
18 growth in terms of tonnage of either raw steel or  
19 finished products in the iron and steel industry.

20 Basically, the iron and steel industry  
21 first has to produce the raw steel, which is then  
22 rolled into a number of different products. So, we  
23 look at about ten distinct products in the industry.

24 If we look at energy or electricity  
25 consumption in the iron and steel industry, about a

1 third of electricity consumption goes into the  
2 production of the raw steel stage. The majority of  
3 electricity is in the actual finishing operations of  
4 the various steel products.

5 I have lumped together these steel  
6 products into three categories: flat-rolled products or  
7 slab products, billets and blooms.

8 Flat-rolled products use 44 per cent of  
9 electricity use. So they are a major consumer of  
10 electricity. Flat-rolled products are basically sheet  
11 and strip, the sort of product used in automobile  
12 manufacturing. There is an interesting trend towards  
13 higher quality sheet and strip, like galvanized steel  
14 demanded by the auto industry, and this shift towards a  
15 higher value type of steel, higher quality of steel,  
16 has with it an increase in electricity intensity, since  
17 electricity is used to produce this higher quality.

18 Billet products are basically light  
19 structural shapes: wire, rebar, commodities like that.

20 Bloom products are your heavy structural  
21 shapes: rails, pipes, beams and products like that.

22 What I'd like to do now is talk about  
23 technologies both in the raw steel production, and then  
24 afterwards in the actual finishing operations for these  
25 products. So if you would turn to the next overhead,

1 chart No. 20.

2 Raw steel is produced basically in two  
3 different types of mills in Ontario. Mini-mills, which  
4 use electric arc furnaces; integrated mills which use  
5 the traditional coke oven, blast furnace, basic oxygen  
6 furnace combination. Your integrated mills are your  
7 Stelco, Dofasco, Algoma. Your electric arc, your  
8 mini-mills, are Slater Steel, Lasco, Ivaco, companies  
9 like that.

10 It is important to keep in mind the  
11 difference between electric arc furnaces for producing  
12 steel versus integrated mills, because there is a  
13 dramatic change or difference in the amount of  
14 electricity used with these two technologies. Electric  
15 arc furnaces use eight to ten times the amount of  
16 electricity per ton of steel as integrated mills do.  
17 And electric arc furnaces currently account for 15 per  
18 cent of production of steel in the province.

19 In the U.S. recently, there has been  
20 quite a growth in the share of steel production by  
21 mini-mills. Basically they have a capital cost  
22 advantage. They can be produced in smaller capacity  
23 mills.

24 ...

25

1 [10:20 a.m.] As far as future penetration of electric  
2 arc furnaces, which could have a dramatic impact on  
3 electricity used, we are assuming that there will be  
4 some factors that would mitigate against electric arc  
5 furnaces being -- taking over the market, basically.

6 Two reasons for that: Electric arc  
7 furnaces are charged with scrap, they don't use virgin  
8 iron ore, they use scrap, and there certainly is a  
9 sufficient supply of scrap in the province; what is  
10 harder to find is good quality, low residual, low  
11 impurity scrap.

12 High quality scrap is required to produce  
13 high quality steel. You cannot cold roll or galvanize  
14 low quality steel, it must be a higher quality product  
15 and, because of that, the mini-mills have had, and will  
16 continue to have, a problem entering a very important  
17 part of the market.

18 Mini-mills themselves, as far as their  
19 efficiencies go, have been improving historically, will  
20 continue to improve. So there are some efficiency  
21 gains that we are assuming for these electric arc  
22 furnaces.

23 If I look at integrated mills, they use,  
24 as I mentioned, significantly less electricity than the  
25 mini-mills and there are some interesting things that

1 are happening in the integrated mills.

2 Integrated mills rely on coke ovens and  
3 the coke ovens are getting closer to their lifespans',  
4 they're getting older and older; there's also a lot of  
5 concern regarding emissions from the coke ovens and the  
6 environmental concerns associated with that. So the  
7 integrated mills are facing the dilemma of what to do  
8 about increasing their productivity, given the  
9 restraints on their coke ovens.

10 And a technology which has been embraced  
11 in a number of areas, Japan, for example, and which has  
12 been proven, is coal injection, where basically you  
13 inject coal into the blast furnace, which results in a  
14 smaller need for coke as part of the charge into your  
15 blast furnace. In essence, you end up having higher  
16 productivity because, per ton of steel output, you need  
17 less coke and all the environmental issues associated  
18 with the coke.

19 However, to use coal injection you have  
20 to provide an oxygen-rich environment in the blast  
21 furnace, which means you have to produce the oxygen,  
22 and oxygen is produced using cryogenic techniques that  
23 use a lot of electricity. So there is an impact on  
24 electricity use by using this measure to offset  
25 environmental emissions associated with coke ovens.

1                   One thing I might have forgotten to  
2           mention is that, in our forecast, we basically are  
3           assuming that all new production capacity will go to  
4           electric arc furnaces, but integrated mills will  
5           maintain their own; they will maintain production  
6           levels currently in place, so that by the end of the  
7           forecast period, the share held by electric arc  
8           furnaces will grow from 15 to 40 per cent of all steel  
9           produced but that the integrateds will still have 60  
10          per cent of steel production in the province.

11                   If we turn to the next overhead, overhead  
12          No. 21, these are the various finishing operations and,  
13          as I mentioned, finishing actually accounts for a large  
14          percentage of the electricity use in the iron and steel  
15          industry. We certainly expect further penetration of  
16          continuous casting.

17                   What that refers to is basically pouring  
18          the steel into -- closer to the final shape required  
19          for the final product as opposed to going through the  
20          ingot stage. If you go through the ingot stage, you  
21          have to reheat the ingot and go through additional  
22          operations to get to the final stage. By saving some  
23          of these reheating and rolling operation, you end up  
24          saving energy and electricity.

25                   Interestingly enough, when you go to

1       continous casting, you also reduce scrap, and scrap is  
2       the input to electric arc furnaces, so a bit of a  
3       circuitous situation when you go to continuous casting.

4               Two examples of newer continuous casting  
5       technologies which are very interesting for mini-mills  
6       are thin slab and thin strip casting. Producing thin  
7       slabs and strips has always been a very difficult  
8       enterprise. Basically what you're doing there is  
9       producing -- pouring your product to be very thin, and,  
10      therefore, requiring very little rolling to get to the  
11      final sheet and strip that is of interest.

12             The interesting thing about these two  
13      technologies is that they can be installed economically  
14      at capacities small enough to be accessible to  
15      mini-mills, which means these two technologies might  
16      allow mini-mills and their electric arc furnaces to  
17      enter the flat-rolled product, which is a product  
18      which, at this stage, they have not been able to get  
19      into. Again, it's got electricity consequences,  
20      because they use a great deal of electricity.

21             Finally, something which I mentioned  
22      before is that there is a shift towards higher quality  
23      of product as demanded by consumer products or  
24      automobile production. Cold rolling is one particular  
25      process which does require a significant amount of

1 additional electricity use. There's a cold rolling  
2 complex slated for Dofasco in 1992, additional  
3 galvanizing also is expected and that also has an  
4 increased electricity use.

5 So basically some of the casting  
6 operations result in decreased electricity use,  
7 decreased rolling, some other higher quality induced  
8 technologies will result in increased electricity use.

9 Q. What I would like you to do at this  
10 point is, again, do what was done at the end of the  
11 economic forecast area and that is, indicate the  
12 comparison of the forecast levels for the 1990 end-use  
13 forecast to the previous end-use forecast that, I  
14 guess, the '88 or '89 forecast?

15 A. I'll do the '88 forecast.

16 Q. Good.

17 A. One thing I want to caution everyone  
18 about in comparing the '88 to the 1990 forecast is that  
19 there is a definitional difference in the various  
20 sectors between the two forecasts.

21 So if you just look at residential growth  
22 in the '88 forecast and then look at the residential  
23 growth figure in the 1990 forecast, you are somewhat  
24 comparing apples and oranges.

25 In 1988, all multi-residential units, all

1 apartments, were considered to be residential and so,  
2 therefore, the electricity use associated with  
3 apartments was included under residential consumption.  
4 In the 1990 forecast, multi-residential units are  
5 considered to be part of the commercial sector so,  
6 therefore, commercial growth is influenced by the  
7 inclusion of apartments.

8 So what I am going to do now is that I  
9 made sure the definitions are the same for the 1988 and  
10 1990 forecasts so this definitional difference will not  
11 impede comparison of the two forecasts.

12 Residential. Now, when I talk about  
13 residential now, it's strictly single-family dwellings,  
14 the definition used currently for the 1990 forecast.  
15 The 1990 forecast for the residential sector is  
16 somewhat higher than the 1988 forecast.

17 When I look at the reasons for this there  
18 are two factors that basically would result in a  
19 lowering of the 1990 forecast. The single-family  
20 household growth is lower, and we do have all these  
21 standards and the resultant deficiency improvements  
22 that would lower it; however, that is more than offset  
23 by our assumptions regarding appliances, leading to --  
24 appliance penetration leading to a somewhat higher  
25 growth in the residential sector.

1 Q. Could you give some sense of the size  
2 of that change?

3 A. If I were to just look at the -- oh,  
4 sorry. The 1990 forecast is 2 per cent per year, the  
5 '88 forecast is 1.9 per cent, so it's not really a  
6 very, very large difference in growth rate.

7 If I look at the commercial sector, and  
8 now the commercial sector I am talking about is  
9 strictly commercial space as in offices, retail, et  
10 cetera; I am not talking about apartments. So, we are  
11 just looking at pure commercial space.

12 The 1990 forecast is higher than the 1988  
13 forecast. The reason for that, to a large part, is due  
14 to the higher floor space forecast in the 1990  
15 forecast.

16 What's rather interesting, though,  
17 between these two forecasts --

18 THE CHAIRMAN: I am sorry, due to the  
19 what?

20 DR. BUJA-BIJUNAS: The floor space, the  
21 amount of square feet.

22 THE CHAIRMAN: Why is it different from  
23 the two? I am sorry, why is it different from '88 and  
24 '90?

25 DR. BUJA-BIJUNAS: The floor space

1 forecast was re-estimated using more data which had  
2 become available during the two-year interval that  
3 caused us to change some of our assumptions.

4 As far as electricity use by the floor  
5 space, what's interesting is that we assume greater  
6 efficiencies in the commercial sector for the 1990  
7 forecast but we also assume greater offsets by  
8 utilization factors, operating conditions.

9 So the bottom line, as far as electricity  
10 use for each end-use, isn't very much different between  
11 the two forecasts but some of the reasoning has changed  
12 between them.

13  
14  
15  
16  
17  
18  
19  
20  
21  
22  
23 ...  
24  
25

1 [10:35 a.m.] Another consideration is that we have  
2 stronger growth in office equipment for the 1990  
3 forecast compared to the 1988.

4 The net change for the commercial sector,  
5 the 1990 forecast is a 2.9 per cent growth; the 1988  
6 forecast is a 2.2 per cent growth.

7 If I look at apartments, there is a small  
8 difference between the 1990 forecast and the 1988  
9 forecast.

10 Turning to the industrial sector, the  
11 1990 forecast is lower than the 1988 forecast and there  
12 are a number of reasons for this. Two industries in  
13 particular should be noted, one of which is mining. It  
14 is significantly lower in the 1990 forecast as opposed  
15 to the 1988 forecast.

16 A lot of the underlying reasons behind  
17 the mining forecast being lower this time is that we  
18 have assumed greater efficiency improvements for mining  
19 operations.

20 We are still assuming a tendency toward  
21 all-electric mines away from diesel-powered mines;  
22 however, we are assuming additional technologies, such  
23 as hydraulic drills, et cetera, which has significant  
24 efficiency improvement changes associated with them.

25 Also, pulp and paper, as I have already

1 discussed, does incorporate recycling, significant  
2 recycling assumptions in the 1990 forecast, compared to  
3 '88, and that causes a decrease in the growth rate for  
4 this industry.

5 The net result is: For the industrial  
6 sector, the 1990 forecast is for about 2.2 per cent  
7 versus 2.3 per cent for 1988.

8 If I look at the total basic forecast  
9 produced by the end-use approach in the year 2010,  
10 which was the last year for the 1988 forecast, in the  
11 year 2010, the 1990 forecast is 15 terawatthours higher  
12 than the 1988 forecast.

13 MR. B. CAMPBELL: All right. Thank you.

14 Q. I want to then turn back to you,  
15 please, Mr. Burke, and deal with, against the  
16 background of both the econometric modeling results and  
17 all of the end-use modeling results, the judgments that  
18 you have made in the selection of the basic load  
19 forecast, and I think perhaps if we could start with  
20 the residential sector?

21 MR. BURKE: A. Yes, Mr. Campbell. If we  
22 could put on overhead No. 22, it shows the forecast for  
23 the residential sector from 1989 to 2015. If we are  
24 keeping careful track of the growth rates for the  
25 various models as I speak, the difference between my

1 numbers and the numbers you have just heard from Dr.  
2 Buja-Bijunas will be the fact that this forecast for  
3 1990 goes to 2015; whereas for comparison purposes, we  
4 were only going to 2010 because that was as far as the  
5 forecast in 1988 went.

6 For EEMO, the econometric model, the  
7 forecast average is 2 per cent over the 25 years and  
8 results in residential growth of -- the residential  
9 demand in 2015 of 69 terawatthours; whereas REEPS, the  
10 end-use residential model grows at an average rate of  
11 1.6 per cent over this 25-year period and results in a  
12 forecast of 63 terawatthours in 2015.

13 The econometric model analyses appliance  
14 efficiency and space heating use and water heating and  
15 so on, but it does so in an aggregate way. It creates  
16 aggregate indices for these appliance types and looks  
17 at efficiency trends and use trends in an aggregate  
18 fashion.

19 REEPS looks at each of these major  
20 appliance categories and major uses of electricity  
21 individually; and also, as Dr. Buja-Bijunas described  
22 yesterday, has taken a careful look at the other  
23 category of end use and has related this other  
24 category's growth to income and how that changes over  
25 time.

1                   Effectively, the forecasts are not all  
2                   that different, but we have much greater confidence in  
3                   the REEPS results for the residential sector. They are  
4                   much more specific and they work with a much stronger  
5                   information set in preparing the forecast. So, for  
6                   preparing the total basic load forecast, the REEPS  
7                   results, in their entirety, are used to represent the  
8                   residential sector.

9                   Turning now to overhead No. 23, this  
10                  shows the industrial sector forecast. Here, the  
11                  results are actually even closer than in the  
12                  residential sector between the two sets of models.

13                 I might remind you that one of the  
14                 reasons that you would expect these models to be in the  
15                 same ballpark is they are using the same economic  
16                 drivers and energy price drivers in both cases. So  
17                 really, what we are capturing with the two model sets  
18                 is different views about electricity intensity in  
19                 future.

20                 The econometric model is producing a  
21                 forecast that averages 2.4 per cent over the 25 years,  
22                 resulting in 88 terawatthour demand in the year 2015.

23                 INDEPTH, the end-use model, produces a  
24                 forecast which averages 2.2 per cent and a level in  
25                 2015 of 84 terawatthours. The difference 25 years from

1 now of 4 terawatthours is relatively small.

2 The effect of things like recycling and  
3 increased emphasis on environmental issues, which  
4 condition the end-use forecast, is not really something  
5 that the econometric forecast can be expected to pick  
6 up. Certainly, the recycling trend that we are  
7 building into the forecast for pulp and paper is a  
8 dramatic change from the past, so that one would expect  
9 that the forecasts should be lower than a pure  
10 econometric forecast would suggest.

11 And the INDEPTH forecast, with its high  
12 quality analysis of the process models for the major  
13 industries, gives us confidence that it is doing a good  
14 job in modeling industrial demand.

15 So, again, there is a decision to use the  
16 end-use model in its entirety for forecasting  
17 industrial loads.

18 Finally, turning to the commercial  
19 sector, on page 24 of the exhibit, we find that the  
20 results diverge significantly between the two sectors.  
21 The econometric model -- well, let me give you the  
22 results first. For the econometric model, the growth  
23 rate averages 3.6 per cent over 25 years, leading to  
24 commercial sector demand of 115 terawatthours in the  
25 year 2015. Whereas COMMEND, the commercial end-use

1 model, averages 2-1/2 per cent growth over the period  
2 to 2015 and results in a demand of 90 terawatthours in  
3 that year.

4 Now, we put a lot of effort this year,  
5 which is described in Exhibit 77, into looking at the  
6 econometric results for the commercial sector. That  
7 exhibit does describe some of the concerns we have with  
8 the data set for the commercial sector and some of the  
9 econometric problems we had in modeling the sector  
10 well. Nonetheless, this model we have now is, if  
11 anything, in my view, a statistically better model than  
12 the one that we were working with in previous years.

13 I think, in part, what is happening is  
14 that there has been a rather rapid growth in commercial  
15 sector loads from the latter half in the 1980s, and  
16 this trend is being picked up by the econometric model  
17 and shows up in faster growth in the future.

18 That new load in the latter half of the  
19 1980s is not to be dismissed, though. There are  
20 definitely real forces at work here to change the way  
21 electricity is being used in the commercial sector.  
22 And we cannot claim to precisely understand all of the  
23 things that are going on in the way the loads are  
24 evolving in that sector.

25 There is probably greater uncertainty

1 about the other uses and miscellaneous uses and their  
2 perspective growth rates for this sector than there is  
3 for the other sectors, in my judgment.

4 So, in picking a forecast for the  
5 commercial sector, we have decided not to do what we  
6 did last year. Last year, we simply, in the face of  
7 uncertainty about the commercial sector, split the  
8 difference between our econometric and our end-use  
9 models.

10 This year, we have chosen to go much  
11 closer to the end-use results, reflecting greater  
12 disaggregation of the other categories and greater  
13 understanding, perhaps, of what is going on than last  
14 year, but still recognizing some uncertainty about the  
15 precise nature of new plug loads and where they are  
16 going in future.

17 And so, we have added 5 terawatthours to  
18 the commercial forecast in 2015 and smoothed that  
19 increase through time, and that load has been added to  
20 the miscellaneous equipment portion of the COMMEND  
21 forecast.

22 It actually results in a commercial  
23 end-use forecast which is lower than the 1989 forecast.  
24 The 1989 forecast, though, was higher than the '88  
25 forecast, so it has gone up and down again.

1                   So, if we could now turn to the overall  
2 picture for the basic load forecast. It is shown on  
3 page 25. The total forecast, as I have described it,  
4 is essentially an end-use forecast, with the exception  
5 of the 5 terawatthour upward adjustment taking into  
6 account the upside risks that the econometric model  
7 shows for the commercial sector.

8                   And you can see, essentially, the point  
9 of this overhead is to show the tracking of the  
10 recommended basic forecast just above the end-use  
11 results.

12                  To give you a sense, more quantitatively,  
13 of where this ends up, if you could turn to page 26.  
14 This shows the growth rates by sector focussing on the  
15 '89 to 2015 period. The recommended commercial sector  
16 growth rate is 2.7 per cent. That is up from the 2.5  
17 for the end-use I just mentioned to take into account  
18 that 5 terawatthour addition.

19                  The industrial sector is the next most  
20 rapidly growing at 2.2 per cent; and the residential  
21 sector averaging 1.6 per cent over that period;  
22 resulting in a basic load forecast that averages 2.3  
23 per cent over the 1989 to 2015 period.

24                  Q. I think you were going to compare  
25 that, the recommended basic basis, then, with the

1 forecast that is in the Demand/Supply Plan  
2 documentation?

3 A. Yes, I would like to do that. It is  
4 on page 27 of the overhead package. Just to show that  
5 we are not too far off base at the beginning of this  
6 whole exercise, the forecast that we made for basic  
7 load in the DSP, which was done in 1988 for 1990, was  
8 for 140 terawatthours.

9 And the weather-corrected actual, which  
10 is the relevant measure of load for this sort of  
11 purpose, for 1990, was 139.4 terawatthours. So, we are  
12 starting this just a little bit low about .4 per cent  
13 below the forecast that we submitted to you in the  
14 document, Exhibit 3.

15 By the year 2000, there is a 1.1 per cent  
16 difference between the two forecasts. And by the year  
17 2010, the recommended basic is 230 terawatthours versus  
18 220, as in the DSP document, which is 4-1/2 per cent  
19 higher.

20 We did not have a forecast for 2015 in  
21 the DSP. The current number is 252 terawatthours for  
22 that year.

23 THE CHAIRMAN: I am sorry, I don't quite  
24 follow how you derive the difference from -- take the  
25 2,000, 184, 186, plus 1.1.

1                   How is that done?

2                   MR. BURKE:  Simply the ratio of 186 to  
3   184; the 2 terawatthour difference on a base of 184--

4                   THE CHAIRMAN:  I see.

5                   MR. BURKE:  --is 1.1 per cent.

6

7

8

9

10

11

12

13

14

15

16

17

18

19

20

...

21

22

23

24

25

1 [10:51 a.m.] MR. B. CAMPBELL: Q. If you could then,  
2 Mr. Burke, if you could then do again what we did at  
3 the end of the discussion of the economic forecast,  
4 could you compare, please, how your forecast compares  
5 with such other load forecasts as may be available for  
6 the Province of Ontario?

7 MR. BURKE: A. Yes, in the demand/supply  
8 document on page 33, we have provided a table which  
9 showed other forecasts that were available to us at the  
10 time. In interrogatory response 1.9.5, we updated that  
11 table with the most recent forecasts that we had  
12 available to us at the time the response was prepared,  
13 which was in January.

14 It shows that Energy, Mines and Resources  
15 had a 1989 forecast, for the period '88 to 2000, of 3.8  
16 per cent growth. We have since learned that their 1990  
17 forecast, which became available sometime in the last  
18 month or two, is a forecast of 3.3 per cent growth for  
19 the 1990 to 2000 period. So it is down about a half a  
20 percent from what they were saying the year before.  
21 So, that is in fact an update to the update on this  
22 interrogatory.

23 Otherwise, the Ministry of Energy, to our  
24 knowledge, has not changed its forecast since the time  
25 of the DSP and DRI has a forecast which is slightly

1 lower, two and a half per cent, slightly lower than the  
2 forecast they had in -- at the time DSP was prepared,  
3 when it was 2.7 per cent.

4 Q. All right, perhaps for those who are  
5 following this in the transcript and don't have the  
6 document in front of them, you could indicate what the  
7 Ministry of Energy forecast was and over what period it  
8 ran and when it was prepared?

9 A. For the period 1988 to 2000, the  
10 forecast was 2.8 per cent per annum. Our forecast for  
11 that same interval is 2.9 per cent. The Ministry of  
12 Energy forecast is sourced from the Ontario Energy  
13 Review dated March 1989.

14 Q. Thank you.

15 Now Dr. Buja-Bijunas, I want to come back  
16 to you, and take you again through the various sectors  
17 that you are responsible for, but this time coming at  
18 it from a slightly different perspective.

19 As I understand it, analysts sometimes  
20 look at intensity trends in producing a forecast of  
21 electricity, and perhaps you could start off in this  
22 area by explaining what you mean when you're talking  
23 about electricity intensity.

24 DR. BUJA-BIJUNAS: A. During my  
25 discussion of the end-use results, I used the term

1 intensity quite often at a micro level, also referring  
2 to the kilowatt hour consumption per refrigerator or  
3 per ton of steel produced, et cetera.

4 What I want to do now is look at  
5 intensities as they are more generally considered, at  
6 an aggregate level, either for example the intensity of  
7 electricity used for the economy as a whole, or the  
8 intensity of electricity used in the residential sector  
9 or the commercial sector or for the industrial sector  
10 at an aggregate level.

11 Q. Now how do you use intensities, when  
12 you are considering the appropriateness of the forecast  
13 you propose to recommend?

14 A. The first thing I want to emphasize  
15 is that this aggregate intensity is not an input to the  
16 forecast but is rather the output. It is the  
17 implication of your forecast that I am looking at.

18 Intensities are a useful yard stick to  
19 basically look at the implication of a very  
20 disaggregated analysis for the future, to see what that  
21 analysis means in aggregate, especially compared to  
22 history. Not saying that future intensities  
23 necessarily have to be higher or lower or have to be a  
24 certain direction compared to historical intensities,  
25 but they give you more or less a comfort level, insofar

1 as that they are different. You should make sure that  
2 the reasons behind the differences are accountable.  
3 That you are comfortable for that.

4 So, basically, it just twigs you; if the  
5 intensity suddenly has a very different trend as a  
6 result of your forecast from your historical intensity,  
7 you want to make sure that feels all right. You want  
8 to make sure your explanation is a sound explanation  
9 for that sort of behaviour.

10 The other thing to realize about  
11 intensities is that they do provide a good  
12 communication tool. Not everybody does the same sort  
13 of forecasting in addressing the same end-uses, the  
14 same disaggregated level of analysis. So to compare  
15 forecasts, often you do it in terms of aggregate  
16 intensities.

17 But what I would like to do is caution  
18 you to some extent about the implications of  
19 intensities. There is an awful lot of analysis buried  
20 inside an intensity. Just because an intensity goes up  
21 does not mean you are using electricity less  
22 efficiently. It could be brought about by product mix  
23 changes. An industry, for example, switching from  
24 producing one product to another product, which just  
25 happens to use more electricity because it relies on

1 certain technologies. They are not doing things less  
2 efficiently, they just changed the products they are  
3 producing. But that does lead to an overall potential  
4 increase in intensity.

5 For the same reason, a decrease in  
6 intensity may not necessarily be due to efficiency  
7 improvements, but a change in composition, in some way,  
8 of your sector.

9 So, although they are a communication  
10 tool, it is a starting point, and you really have got  
11 to get down to some of the disaggregated assumptions to  
12 really compare what forecasts across the different  
13 jurisdictions are really saying.

14 Q. All right. I'd like to move through  
15 the sectors in that analysis, and perhaps we could  
16 start with the industrial sector that we have been  
17 talking about already this morning, and then we will go  
18 back to deal with the ones we talked about yesterday.

19 A. Okay, the first overhead actually is  
20 out of order in the exhibit, and you want to turn to  
21 chart No. 30.

22 There are two basic issues that I want to  
23 address in the analysis of intensity shifts in the  
24 industrial sector. The first is the concept of  
25 structural shift within the industrial sector.

1 Individual industries each contribute to the GDP output  
2 of the industrial sector, but they all have different  
3 weights. Some industries contribute more to the GDP,  
4 some contribute less depending on the size of the  
5 industry. So you have a certain structure in place.

6 As given industries decline or grow,  
7 their share in GDP will change. Keeping in mind each  
8 industry has a different electricity intensity, each  
9 industry uses electricity to a different extent. As  
10 that relative weighting of each industry changes, as  
11 the relative share of output changes, that is going to  
12 lead to a change in the intensity of your industrial  
13 sector, and that is referred to as structural shift  
14 brought about by output changes in the industrial  
15 sector.

16 Instead of talking about all the  
17 industries, what I'd like to do is basically divide up  
18 the industrial sector into two types of industries.  
19 The process industries, one category, the other the  
20 fabrication assembly industries.

21 The processing industries include paper  
22 and allied, primary metals, chemicals and mining. And  
23 these industries basically take your raw material and  
24 produce the products that are usually used as inputs to  
25 your fabrication assembly industries, such as

1 automobile manufacturing.

2 What I'd also like to mention is that  
3 within a given industry, not only do you have changes  
4 in the contribution to output of each industry, but  
5 within each industry the intensity of electricity used  
6 might change due to efficiency improvements,  
7 technological changes, et cetera. So, you not only  
8 have this switching between industries, but  
9 developments within a given industry that would affect  
10 its own electricity intensity. And those factors are  
11 addressed in this chart.

12 Basically, if I look now at the  
13 processing industries, structural changes --  
14 historically, as Mr. Rothman mentioned yesterday, the  
15 share of process industries to GDP's has been declining  
16 historically. And we are expecting it to decline in  
17 the future as well. Keeping in mind that the process  
18 industries are four times as intensive in their use of  
19 electricity as the fabrication industries, the shift  
20 away from the process industries certainly has an  
21 impact on the intensity of the industrial sector.

22 As far as the intensity within the  
23 process industries, we see that as going down in the  
24 future, due to things like recycling in the pulp and  
25 paper industry, more efficient mining techniques, the

1 use of continuous casting in the iron and steel  
2 industry.

3 If I look at fabrication assembly  
4 industries, their share, historically, of GDP output  
5 has been increasing, and is expected to continue  
6 increasing in the future. Their intensity relative to  
7 process industries is significantly lower, but we are  
8 expecting, as a group, their intensity would increase  
9 over the forecast period.

10 Basically, the bottom line is that we  
11 expect structural shifts within the industrial sector  
12 will serve to lower industrial intensity. As well,  
13 component intensity impacts raised industrial intensity  
14 historically, but we expect it to have a compensating  
15 impact in the future.

16 Q. I think if you then look at page 31,  
17 that sort of shows -- that is illustrated in the chart  
18 there?

19 A. Yes. Overhead 31 basically takes all  
20 the figures, and it is a chart of GDP -- excuse me,  
21 electricity intensity per GDP in kilowatthours per 1981  
22 dollar, starting in 1970 and extending out to the end  
23 of the forecast period. And what you will notice is  
24 that the intensity shift, then, for the industrial  
25 sector, goes down minimally, but it is basically pretty

1 constant over the forecast period.

2 Q. All right, now some of the figures,  
3 or the figures, as I understand it, that go with these  
4 various tables and charts in the different sectors, can  
5 be found in the answer to Interrogatory No. 1.7.14, is  
6 that correct?

7 A. That is correct.

8 Q. Now perhaps then you could deal with  
9 the commercial sector, which we dealt with yesterday in  
10 terms of forecasting, but dealing with it this time in  
11 terms of what we see happening. What the results show  
12 by way of intensity.

13 A. Okay. One of the things is that, for  
14 intensity in the commercial sector, I will be using  
15 electricity per square foot as my intensity measure.

16 Q. All right.

17 A. You have to go backwards to chart 28,  
18 because they are out of order.

19  
20  
21  
22  
23  
24 ...  
25

1 [11:00 a.m.] I'll get going anyway. I'm going to look  
2 at things the same way as I did for the industrial  
3 sector, structural shifts and intensity effects within  
4 different building types.

5 In the industrial sector I talk about  
6 structural shift, I was referring to shifts in output  
7 between the various industries and here I'm talking  
8 about shifts in floor space between different building  
9 types, different commercial space.

10 Commercial space has different shares  
11 of -- is made up of different types of buildings  
12 providing different commercial services and, as such,  
13 every commercial building type has a different  
14 electricity intensity associated with it reflecting  
15 what it is, it does. And naturally then, as each type  
16 of commercial segment grows and declines, just as each  
17 industry grows and declines, its share of commercial  
18 square footage will change and that will lead to a  
19 structural change.

20 Also, within a given commercial segment,  
21 for example, within the office segment or within the  
22 retail segment, you can have changes in the intensity  
23 of electricity use. As I mentioned yesterday, the PC  
24 issue is a major one resulting in increased electricity  
25 intensity in especially the office segment.

1                   So, in my analysis I'm going to look at  
2 two groups of commercial building space. I will  
3 disaggregate everything to two groups. First, the  
4 office/retail segment which provides business, finance  
5 and retail trade services and then the institutional  
6 segment which basically provides educational, social,  
7 health and accommodation services; two very different  
8 types of segments.

9                   Q. Okay. Can you deal first then with  
10 the office/retail segment?

11                  A. Historically, in the office/retail  
12 segment there has been a growth in the contribution of  
13 the segment to total commercial space. We are  
14 forecasting a continued growth in the share of  
15 commercial space by office/retail.

16                  If I look at electricity intensity in  
17 office/retail, again, office/retail is twice as  
18 electricity-intensive as the institutional sector, and  
19 we're also expecting the intensity of office/retail to  
20 be increasing in the future.

21                  If I look at institutional, there has  
22 been a historical decline in construction of  
23 institutional type space - schools, for example, have  
24 been declining - and we expect a further decline in the  
25 share of institutional in the future as well.

1 Institutional space is not as  
2 electricity-intensive as office/retail, but we do  
3 expect an increase, a continuing increase, in the  
4 intensity of electricity use within the institutional  
5 sector basically as catch up to office/retail. They  
6 are now starting to use PCs more; they are somewhat  
7 delayed and will not be as intensive in use, but will  
8 start taking up some technologies that have been in  
9 place historically in office and retail.

10 If I put together both these  
11 institutional shifts -- both the structural shifts and  
12 the intensity shifts, you get chart No. 29. You will  
13 remember the industrial sector was basically flat  
14 across the forecast.

15 Commercial electricity per square foot  
16 across the entire commercial sector is expected to  
17 increase over the forecast period and you will notice  
18 there was quite an historical increase in this  
19 intensity as well.

20 Q. All right. Now, Mr. Rothman spoke of  
21 the shift between the goods-producing and  
22 services-producing aspects of the Ontario economy. How  
23 is that -- before we get to residential against the  
24 background of the industrial and commercial discussion  
25 that we've just had, how is that shift from

1 goods-producing and service-producing aspects of the  
2 Ontario economy reflected in electricity intensities?

3 A. Okay. The D industrialization of the  
4 economy refers to the decreasing contribution of the  
5 industrial sector to total Ontario economic output,  
6 that is, a structural shift from industrial to  
7 commercial, just as I discussed the structural shift  
8 within industrial from processing industries to  
9 fabrication industries; in the commercial sector from  
10 institutional type space to the office/retail business  
11 type space.

12 If I look at the structural shift  
13 historical -- there has been a growth historically in  
14 the contribution of the commercial sector to Ontario  
15 GDP, and we expect that to continue in the future. The  
16 commercial sector is also four times less  
17 electricity-intensive than the industrial sector.

18 Historically, then, the structural shift  
19 decreased the electricity intensity of the economy.  
20 You are going towards a commercial sector, it is less  
21 electricity-intensive, and we expect that to continue  
22 to be the case.

23 If I look within industrial and within  
24 commercial, as far as the intensities within these two  
25 segments, commercial intensities are increasing, as I

1 mentioned, industrial decreasing, so that we expect an  
2 overall decrease in intensity in the future.

3 You can see these results in overhead  
4 32 -- chart No. 32. What this gives is the electricity  
5 consumption of the industrial plus commercial sectors.  
6 This is not total electricity consumption, it does not  
7 include the residential sector, this is strictly  
8 industrial plus commercial divided by total GDP output.  
9 And you can see there's a slow decline in the intensity  
10 of the combined industrial/commercial sectors.

11 Q. All right. Finally, in this area, I  
12 would like you to deal with what you see happening to  
13 electricity intensity in the residential sector?

14 A. If you would turn to chart 33.

15 And here, for intensities, I'll be using  
16 the measure kilowatthour per household; in other words,  
17 the average household in Ontario, how many  
18 kilowatthours has it used historically, and what does  
19 the forecast say about this.

20 In this particular chart, I am including  
21 both single-family dwellings and apartments; in other  
22 words, all households in the Province of Ontario.

23 When you look at this chart, you can see  
24 there are certain key periods showing different growth  
25 rates in intensity over history. If you first focus on

1 the early 60s 'til about the mid-70s or so, you see one  
2 particular growth rate, a pretty high growth rate in  
3 the intensity in the residential sector.

4 This strong growth was basically due to a  
5 rapid increase in the penetration of traditional  
6 residential uses: your refrigerators, stoves, washers,  
7 things like that so. So there was a quick ramp up due  
8 to the electrification, as it were, of homes in  
9 Ontario, and since these appliances are relatively new,  
10 they are also relatively electricity-inefficient  
11 compared to today's standards, further resulting in  
12 this increase in intensity.

13 By the time you get to the mid-1970s,  
14 things flatten out somewhat, and that is a reflection  
15 of the energy crisis that occurred in that period,  
16 which had a spillover effect on electricity use.  
17 People were trying to get more efficient.

18 Also, by this stage most people have  
19 their refrigerators, stoves, et cetera, so you are  
20 closer to saturation. You have a slower growth in  
21 pick-up of traditional end-uses and that also slows  
22 down this intensity growth.

23 If you look beyond this flattening out  
24 period to the latter part of 1980s, from around 1985 to  
25 1989, you, again, see a step-up in the intensity of

1 electricity use, and there are a number of factors  
2 accounting for this step-up. One of the most important  
3 is the very high construction activity that occurred  
4 during that period.

5 And, as I mentioned yesterday, the  
6 marginal share of electricity, for example, for space  
7 heating; in other words, the share of use of  
8 electricity as a space heating option for brand new  
9 houses is higher than the average; it's at about 32 per  
10 cent. So, as you have a high construction activity,  
11 the penetration of these new houses with large  
12 electricity use into the stock of total houses  
13 increases leading to an overall intensity measure  
14 increasing.

15 The other factor that occurred during  
16 these years was the growth of income, and a lot -- some  
17 of the end-uses are very much related to income levels.  
18 The acquisition of a lot of appliances is related to  
19 income levels and, as they were growing, it caused  
20 people to purchase these appliances, resulting in  
21 increased electricity use.

22 In particular, air conditioning grew  
23 very, very strongly during this period and that was  
24 brought about by two things: both the income effect and  
25 also two very, very hot summers that caused people to

1 go out and buy all these air conditioning units.

2 As far as the future is concerned, you  
3 will again see the intensity flattening out into the  
4 future period and that is brought about by a number of  
5 considerations; appliance standards are one, the  
6 Ontario Building Code is another. Both of these things  
7 will lower electricity intensity.

8 We also have lower construction rates, so  
9 we have a lower penetration of newly constructed homes  
10 into the total household base. Energy prices also will  
11 put electricity at a disadvantage, for a while at  
12 least, versus natural gas as a space heating option,  
13 and income levels are not expected, again, to rise as  
14 quickly. And one thing I had mentioned is the  
15 importance of that other appliance category, which is  
16 very much driven by income, and so that will also  
17 flatten out the intensity per household.

18 MR. B. CAMPBELL: Thank you.

19 Mr. Chairman, we're about to move on to  
20 another topic area that I think will take a little  
21 longer than what we have to the morning break time, and  
22 is itself fairly complicated. I don't know; depends  
23 how comfortable one is mathematically.

24 In any event, I would suggest that this  
25 would be an appropriate time for the morning break.

1 THE CHAIRMAN: Very well, we will break  
2 for 15 minutes.

3 THE REGISTRAR: This hearing will recess  
4 until 25 minutes to twelve.

5 ---Recess taken at 11:18 a.m.

6

7

8

9

10

11

12

13

14

15

16

17

18

19

20

21

22

23

24

25

...

1 ---On resuming at 11:37 a.m.

2 THE REGISTRAR: This hearing is again in  
3 session. Please be seated.

4 THE CHAIRMAN: Mr. Campbell?

5 MR. B. CAMPBELL: Thank you, Mr.  
6 Chairman.

7 I am reminded that I made an error in  
8 speaking to the start of the scoping session being at  
9 ten o'clock next week. I believe it is on Monday. It  
10 is on Monday.

11 In fact, the Board's procedures called  
12 for people to be here, I think, at nine, to kind of  
13 work out any last minute things, with the hope that  
14 there is nothing for you to do at ten o'clock, and so I  
15 should have said nine as opposed to ten.

16 With that correction, I would then want  
17 to turn back to you, Mr. Burke.

18 Q. And you started your testimony saying  
19 quite clearly that you can't come before the Board and  
20 prove that any forecast that you are making is  
21 absolutely right or wrong. And that immediately means  
22 that you have to deal with the whole question of  
23 uncertainty.

24 I would like you to address, please, how  
25 you reflect uncertainty about future load growth in

1 making your forecast.

2 MR. BURKE: A. Well, to enable system  
3 planners to better quantify the risks in the forecast -  
4 that is, the risks associated with future load growth -  
5 the load forecast department prepares a complete  
6 probability distribution for the load forecast for each  
7 year of the forecast period.

8 That distribution is typically  
9 represented by its 80 per cent band width; that is, the  
10 range between a 10 per cent point of the distribution  
11 and a 90 per cent point of the distribution, and it is  
12 shown in this overhead, page 34 in the package.

13 So, what is called lower bound here is  
14 the 10 per cent point of the distribution that we  
15 estimate; and the upper bound is the 90 per cent point  
16 of the distribution.

17 And for each year in the forecast  
18 period - that is, from 1991 now - well, actually, we  
19 have included 1990, for that matter, right through to  
20 2015 - a probability distribution was prepared and the  
21 lines are running through the 10 per cent points of  
22 each of those and the 90 per cent points of each of  
23 those.

24 We try to be as objective as possible in  
25 producing this uncertainty band, but nevertheless, I

1 think the best way to view this is as a range forecast,  
2 which is really what it is, and that, as with all  
3 model-based forecasting, there are some key judgments  
4 always entailed in producing the final result; and it  
5 is not possible to just crank this number out, out of a  
6 model pure and simple.

7 Having said that, I think the uncertainty  
8 bands should be seen in the context of the usual  
9 alternatives which are available. Typically, electric  
10 utilities and other groups who try to plan for  
11 conditions of uncertainty postulate alternative  
12 scenarios. These individual scenarios are, in  
13 themselves, somewhat arbitrary in their construction.  
14 They serve various objectives.

15 The probabilities assigned to them are  
16 judgmental. And the way that decisions are made by  
17 trying to bring together the various scenarios and the  
18 judgments and the probabilities together to produce an  
19 uncertainty range or so for planning purposes is, in  
20 fact, an incredibly judgmental process in most cases.  
21 And we have tried to make this less judgmental, but we  
22 are not claiming it is free of judgment.

23 Q. All right. Against that background,  
24 how did you go about estimating that probability  
25 distribution for the forecast?

1                   A. The approach to this problem is  
2                   outlined in Exhibit 10 and, in its most recent  
3                   application, you will find a description for the 1990  
4                   load forecast in Section 7 of Exhibit 9.

5                   Our approach involves building a powerful  
6                   but small two-equation system for load growth; first,  
7                   moving from population growth to GDP growth, and then  
8                   GDP growth to load growth.

9                   This is a system that may be readily  
10                  simulated to generate an estimate of future load growth  
11                  uncertainty.

12                 The estimated distributions from this  
13                 model are aligned with the median forecast that we have  
14                 selected, as I described earlier this morning; that is,  
15                 we feel it is very important that all of the analysis  
16                 that has gone into the multi-equation econometric and  
17                 end-use systems not be lost in the course of producing  
18                 a forecast range with a simple model.

19                 So, effectively, the median forecasts of  
20                 our range is the one that I described earlier to you  
21                 this morning based on the two sets of model results in  
22                 the judgments there; and then we superimpose on that  
23                 forecast the distribution that this model creates.

24                 Q. All right. Can you explain, please,  
25                 how this simulation procedure works in producing these

1 distributions?

2 A. The overhead, page 34 of the  
3 hand-out, is a simplified version of the load equation  
4 that is used in this two-equation system that I just  
5 described.

6 The load equation is somewhat unusual, I  
7 have to admit. It is called a 'variable elasticity  
8 model' and that is, it has the property that the  
9 relationship between load and GDP in this model changes  
10 as GDP grows.

11 This model is capable of successfully  
12 tracking the long-run decreasing ratio of load growth  
13 to GDP growth without any other variables in it such as  
14 energy prices.

15 And the way it does that in practise is  
16 that the co-efficient in the model, which is the B hat  
17 on this overhead, is, in fact, negative. And as GDP  
18 grows over time, the impact is to slow the ratio of  
19 load growth to GDP growth.

20 Q. All right. And just so we have a  
21 page reference close in the transcript, the equation  
22 that is being referred to is set out on page 35 of  
23 Exhibit 100?

24 A. Now, the generator probability --

25 THE CHAIRMAN: Now, just tell me again,

1 please, what A represents and what B represents.

2 MR. BURKE: A and B are the estimated  
3 co-efficients in this equation; that is, this is an  
4 equation estimated by an ordinary least squares  
5 technique. And the estimated co-efficient - that is,  
6 the implied relationship between GDP and load - is  
7 captured by the A hat.

8 The B hat --

9 THE CHAIRMAN: Sorry, just give me that  
10 again. It would be?

11 MR. BURKE: The relationship, direct  
12 relationship between GDP and load, is captured by A  
13 hat. The role that the second term GDP squared plays  
14 is captured by the B hat co-efficient.

15 And in fitting this equation to past  
16 data, if you take A hat times the GDP level for a  
17 particular year, plus B hat times the GDP squared for  
18 that year, there will be a fitting error; that is, the  
19 model will not exactly reproduce load historically.

20 So, that is what the error with the  
21 little hat on it is; it is the difference between what  
22 the estimated model fits for load in that year and the  
23 actual load historically.

24 It is good to be clear about what those  
25 things are because what we now proceed to do is work

1 with each component of this equation.

2 Essentially, what we do is we have  
3 probability distributions for everything on the  
4 right-hand side of the equal sign in order to combine  
5 all those distributions together to get the probability  
6 distribution for load on the left-hand side of the  
7 equal sign.

8 And essentially, then we have a  
9 probability distribution for the A and the B and the  
10 error itself and then we have a probability  
11 distribution for GDP.

12 THE CHAIRMAN: The error is based on  
13 historical analysis; is that what you said?

14 MR. BURKE: Yes. The errors are what we  
15 call the fitting errors on this equation, the  
16 difference between the ability of this equation to  
17 track history and the actual load that occurred  
18 historically.

19 So, each and every year, there is an  
20 error and hopefully a small one. That is the idea.

21 THE CHAIRMAN: But when you are doing the  
22 equation, is that error figure costed for each year in  
23 the future or is it different for different years?

24 MR. BURKE: Well, for forecasting  
25 purposes, it is assumed that errors are zero. The

1 expected value of the error is zero. But the error  
2 does have a variability associated with it; that is, it  
3 contributes to the uncertainty in the result because  
4 you have had errors historically.

5 So, while the expected forecast error in  
6 future is zero, for the purpose of estimating  
7 uncertainty, the variability of these errors in the  
8 past is important; that is, how big the errors were and  
9 how they fluctuated in the past is important for how  
10 variable load itself may be.

11 In doing an ordinarily least squares fit  
12 of load against the two explanatory variables, GDP and  
13 GDP squared, the program that does that automatically  
14 prints out something called a standard error of the  
15 co-efficients and also a standard error for the error  
16 term itself.

17 Now, the standard error is a measure of  
18 the variability of each of these estimates; that is,  
19 there is a point estimate for what A is and then there  
20 is a range that given the data that we have, this  
21 estimate might reasonably range over.

22 And effectively, this estimate of  
23 variability for A and B can be turned into a complete  
24 probability distribution for what A and B might very  
25 well be.

1                   The precise estimate that one might use  
2           to get one's most likely forecast is one point in that  
3           distribution, but the co-efficient itself might range  
4           over a much wider set of values.

5                   So, to summarize then, from the  
6           estimation of the equation itself, we get measures of  
7           uncertainty associated with the A, the B, and the error  
8           term; and from those, we can generate distributions  
9           using normal statistical assumptions.

10                   The remaining task really is then to  
11           generate a distribution that represents the uncertainty  
12           in GDP itself. And when we have all of those  
13           distributions, we use simulation techniques to sample  
14           from each of the distributions, combine them either  
15           multiplicatively or additively, as the equation  
16           suggests, and produce a joint probability distribution  
17           of the factors on the right-hand side which represents  
18           the probability distribution for load itself.

19                   So, I am going to focus now on how we  
20           actually get that GDP distribution, because it is  
21           pretty key in producing the load distribution.

22                   And, in fact, what we do is, rather than  
23           generate a distribution for GDP in level terms itself,  
24           what we do is we generate a distribution for the growth  
25           rate from the present to each year in the forecast

1 period, sort of one year ahead, two years ahead, 17  
2 years ahead, 25 years ahead, growth rates for GDP.

3 So, what we try to do is come to terms  
4 with what is the range of growth rates for GDP at the  
5 80 per cent confidence level 'X' years in the future,  
6 up to the end of our forecast horizon, and it is the  
7 compound growth rate that we are interested in.

8 Now, the way we do that is, with the  
9 second equation I mentioned in the model, and that  
10 translates the problem of forecasting GDP uncertainty  
11 into a problem associated with population uncertainty.  
12 It is the second equation. It has a similar structure  
13 to this one but is not quite the same.

14 And the reason we use population as an  
15 explanatory variable for GDP uncertainty is that, for  
16 one thing, we have a lot of history for population. We  
17 can go back a good 60 years with consistent data for  
18 Ontario for population, and that means we have good  
19 samples with which to estimate the uncertainty  
20 historically that has existed in the growth rates for  
21 the variable.

22 And population, also, amongst the many  
23 variables that one might choose to explain something as  
24 overarching and encompassing as gross domestic product  
25 for an economy, is probably as independent of GDP as

1 anything we can find. We can't use anything as an  
2 explanatory variable for GDP that is, in fact, very  
3 directly related to GDP, or else you end up having to  
4 deal with the correlations and so on, between what  
5 you're trying to explain and what you are using to  
6 explain it with.

7 So, population seemed to us to be the  
8 best variable to use. It is one of the drivers that  
9 Mr. Rothman referred to yesterday.

10 Having said all this, there is no doubt  
11 that the procedure that we used to produce the GDP  
12 distribution does contain several judgments. We made  
13 these judgments bearing in mind the results of a survey  
14 that we did of the 15 members of the External Economic  
15 Forecast Advisory Committee that Ontario Hydro has and  
16 which Mr. Rothman referred to yesterday. And that  
17 group was asked to estimate an 80 per cent band for GDP  
18 for the period from 1987 to 2000 and then from 1987 to  
19 2010.

20 And the results of that survey of these  
21 15 members is given in Exhibit 10. And the results of  
22 our stochastically-simulated band for GDP is, in fact,  
23 very close to this survey result, and this is  
24 intentional.

25 Typically, if a GDP uncertainty band is

1 ever produced, and I think you will find very few of  
2 them around to work with, it is produced using surveys  
3 of expert opinion. However, we required a methodology  
4 that was a little bit more demanding than I think most  
5 of the people we were surveying had been prepared to  
6 put up with.

7 We wanted a band for each and every year  
8 of the forecast period, not just at ten-year intervals.  
9 And we wanted one that we could replicate readily  
10 because of different planning problems that might arise  
11 that might change the starting year, for instance, from  
12 which we needed to have a GDP uncertainty band.

13 And so we went with the methodology which  
14 essentially produces bands that are reasonable by the  
15 tests of our expert judgments - of the expert judgments  
16 of our advisors - and produces the results we require  
17 in terms of the detail and the readiness with which  
18 these can be provided.

19 The survey that underlies Exhibit 10 was  
20 repeated in May of 1990 and produced very similar  
21 results, in terms of what the External Forecast  
22 Advisory Committee views to be the 80 per cent band  
23 width for GDP for Ontario.

24 MR. B. CAMPBELL: Q. All right. Now, as  
25 a matter of interest in all of this, why do you focus

1 on the 80 per cent confidence level; that is, this 10  
2 per cent to 90 per cent range for the purposes of the  
3 band width forecast? Why isn't it 40 or 90 or some  
4 other number?

5 MR. BURKE: A. The load forecast  
6 department produces, as I said, a complete distribution  
7 for load. The choice of planning to cover 80 per cent  
8 of that set of outcomes in terms of how we prepare the  
9 plan is made by the planners, not us.

10 Q. And then so you are responding to  
11 them in focussing on that 80 per cent?

12 A. That's correct. We provide the  
13 complete distribution.

14 Q. Now, I would ask you then -- you  
15 spoke earlier of this range forecast.

16 Could you go through the range forecast  
17 that is associated with the 1990 load forecast?

18 THE CHAIRMAN: What number are we looking  
19 at now, please?

20 MR. BURKE: This is table 36 -- or page  
21 36 of the exhibit, and it shows the levels of the band  
22 width for basic load for December peak, for the year  
23 2000 and the year 2015.

24 And those little numbers in brackets  
25 underneath each of the level results for the year give

1 the difference between the lower and the median and the  
2 median and the upper for those years, and I hope I have  
3 subtracted them correctly.

4 But anyway, the point is that in the year  
5 2000, the median basic forecast is 32.1 gigawatts,  
6 32,100 megawatts, with a range on either side of  
7 roughly 4-1/2 gigawatts; a total 80 per cent range of 9  
8 gigawatts.

9 By 2015, the range is about 14 gigawatts  
10 with a slight upward shift to the band. It is 43.3  
11 gigawatts plus 7.3 gigawatts for the upper band and  
12 43.3 minus 6.5 for the lower band.

13 The point I would like you to take away  
14 from this, apart from the levels themselves, is the  
15 fact that in absolute terms, the band width does  
16 increase over time. This is a little bit in contrast  
17 to what was the first reaction in looking at the next  
18 overhead, which is No. 37.

19  
20  
21  
22  
23  
24 ...  
25

1 [11:59 a.m.] Number 37 shows the growth rates from  
2 the start year of the forecast, that is 1989, through  
3 to various points in the future. And it shows that in  
4 the first few years of the forecast, in the period '89  
5 to '93 for instance, growth rates can range quite  
6 widely. That is, one should interpret those numbers to  
7 mean that on average over the period '89 to '93, growth  
8 could be at the upper end of the distribution 4-1/2 per  
9 cent, or as low as 1/2 percent.

10 But by the time you get out to the year  
11 2000, where economic cycles will probably have gone  
12 through both an up phase and a down phase, and so  
13 various of the extreme results that are possible,  
14 depending on the timing of the phases of the cycle,  
15 have somewhat cancelled themselves out. The average  
16 load band in terms of growth rates is narrower. That  
17 is, from '89 to 2000, we are talking about an 80 per  
18 cent band that ranges from just over 1 per cent to just  
19 less than 4 per cent growth. This is still fairly wide  
20 with a median value of 2.6.

21 Over a 25-year period, the cancelling-out  
22 effects, the offsetting factors accumulate, and in  
23 growth rate terms, it appears as if the band narrows.  
24 And while it is actually getting wider, as I showed you  
25 before, in absolute terms, the growth rates, and for 25

1 years, each 1/10 per cent on the growth rate is quite a  
2 few megawatts, converge a little bit, and the 25-year  
3 growth rates range from 1.6 per cent to 2.9 per cent.

4 MR. B. CAMPBELL: Q. In this area, we  
5 have got a variety of interrogatories and questions  
6 about why this band width didn't continue to diverge  
7 exponentially over time. What is your explanation for  
8 why it develops the way it does?

9 MR. BURKE: A. The pattern for load  
10 growth follows the pattern for GDP growth, and our  
11 empirical results indicate that for both population and  
12 GDP, the further you go into the future -- that is, the  
13 longer in this case, because, really, the longer you  
14 analyse the growth rates, the longer the period is,  
15 over which you analyse historical growth rates and, by  
16 inference, project these into the future, the lower the  
17 variability in the compound growth rate is. This is a  
18 reflection of the view that economic processes tend to  
19 stabilize in the long run around the central rate.

20 For instance, for Ontario population for  
21 the last sixty years, the variability of the mean  
22 growth rate one year ahead is three times as high as  
23 the variability of that growth rate 25 years ahead.

24 Q. That is just looking at the actual  
25 historic data?

1           A. That is just looking at what you find  
2     in looking at the last sixty years of data, calculating  
3     one-year ahead growth rates, looking at their  
4     variability. Calculating 25-year growth rates, we have  
5     35, 25-year growth rates in a 60-year sample to work  
6     with, looking at the variability of those growth rates  
7     over time.

8           Effectively, what happens is the  
9     reduction in population growth variability that is  
10    empirically estimated is translated into a slowdown,  
11    similar slowdown, in GDP growth.

12           But I also should say that the fact that  
13    these growth rate bands are the way they are also  
14    reflects the survey results for GDP that we conducted.  
15    Expert views are that there is a considerable consensus  
16    on where GDP will fall over a 25-year period for  
17    Ontario.

18           Q. Now, I gather that in the application  
19    of this uncertainty methodology, there has been some  
20    evolution in that methodology since the time that the  
21    Demand/Supply Plan, Exhibit 3, was prepared. Perhaps  
22    you could just speak to that.

23           A. The overhead that I am referring to  
24    is page 38 of the exhibit. Let me just say something  
25    about the methodology change before we actually look at

1 the lines themselves.

2 The 1990 methodology is almost identical  
3 to the one we used in 1989, but Exhibit 10 was largely  
4 about the changes we made to the methodology between  
5 1988 and 1989. And you can see that, looking at this  
6 overhead now, that there isn't that much change in the  
7 band width to the year 2000. But, beyond the year  
8 2000, the blue lines stray increasingly from the red  
9 and green ones, which reflect the sort of more advanced  
10 methodology.

11 A question which, or a fact you may be  
12 interested in, is how this 1988 band, the one that was  
13 underlying the DSP plan, how that relates to the  
14 confidence, the entire probability distribution, that  
15 we now see for the 1990 load forecast.

16 In the period 1990 through to about 2005,  
17 the DSP band is at about the 75 to 80 per cent point of  
18 the distribution that we now have for the 1990 load  
19 forecast. But as we move from 2005 to 2010, the upper  
20 band is at the 70 per cent point of the distribution,  
21 and by 2015 it is closer to 60 per cent, to the 60 per  
22 cent point of the distribution that we now see for  
23 load.

24 Q. All right. Now in this graph, you  
25 have talked in terms of peak demand as opposed to

1 energy, and you are dealing here, as I understand it  
2 from the heading, with the primary as opposed to the  
3 basic forecast, the bands that were associated with the  
4 primary forecast. I want to deal with each of these,  
5 and ask you first: How is the peak band determined?

6 A. The approach that we have taken to  
7 estimating the peak uncertainty band is a fairly simple  
8 and straightforward one. And that is to apply the load  
9 factor associated with the median load forecast to all  
10 points on the energy distribution.

11 Q. So it is just a straight translation  
12 using the load factor?

13 A. Yes. We have considered other  
14 alternatives, but have opted for this simple approach,  
15 pending anything better.

16 Q. How then is the translation to the  
17 primary load, as opposed to the basic load derived;  
18 again, when you are moving from the bands associated  
19 with the basic to primary?

20 A. As is indicated in Exhibit 10 toward  
21 the end of the document, there isn't really a very  
22 satisfactory methodology available to us right now to  
23 estimate the confidence band for the primary energy  
24 load forecast. And this is largely because the  
25 difference between it and the basic is the impact of

1 demand management programs, for which we have very  
2 little historical experience, and so we have very  
3 little basis with which to infer how likely or unlikely  
4 the results may be.

5 Q. Now there when you say "how likely or  
6 unlikely," you are just talking about that component,  
7 as I understand it, that relates to the elements of the  
8 difference between the basic and the load forecast?

9 A. That is correct. That is the  
10 uncertainty associated with the electrical efficiency  
11 improvements, the load shifting programs, and the load  
12 displacement non-utility generation programs.

13 That uncertainty may be decomposed into  
14 the uncertainty associated with the potential for these  
15 programs, and the uncertainty associated with their  
16 ultimate penetration rates in the marketplace. And as  
17 I say, we have very little historical experience with  
18 which to infer what that sort of distribution may look  
19 like.

20 In the Demand/Supply Plan, the approach  
21 taken to this problem was to develop high and low cases  
22 for demand management, and to subtract those impacts  
23 from the high and low, the upper and lower bounds of  
24 the basic energy distribution, to produce upper and  
25 lower cases for primary energy, and this had the effect

1 of resulting in a narrower range for the primary load  
2 forecast than was the case for the basic load forecast.  
3 Effectively, in the upper case, you are subtracting  
4 more demand management; in the lower case, you are  
5 subtracting less, and it tended to pinch the band width  
6 together a little bit.

7 We have performed some simulation  
8 experiments subsequent to the preparation of the DSP  
9 plan -- DSP document, and we were looking at the  
10 distribution, the possible distributions of penetration  
11 rates and potential, and we find that it is only under  
12 certain restricted assumptions that we believe that the  
13 primary band should be any narrower than the basic  
14 band. And those really relate to instances where you  
15 have a high degree of confidence about the penetration  
16 rates of demand management programs.

17 One of the things that increases your  
18 confidence effectively, in the uptake of electrical  
19 efficiency improvement, would be standards. So that a  
20 significant replacement of program-driven efficiency  
21 improvement by regulated efficiency improvement would  
22 increase the confidence with which those effects would  
23 be taken up, and would therefore increase the  
24 likelihood of actually increasing the confidence or  
25 narrowing the band width on the primary load forecast.

1                   But under the current circumstances, with  
2           the current standards and the current level of  
3           knowledge of penetration rates of the electrical  
4           efficiency improvement programs, we recommend that the  
5           band width for the basic be used as well for the  
6           primary.

7                   Q. It occurs to me that we have been  
8           speaking several times about standards. I would just  
9           ask you to confirm, when you are dealing with that, you  
10          are dealing with standards that are basically of the  
11          force of law, that are regulations passed under  
12          Ontario's Energy Efficiency Act and are developed by  
13          the Ministry of Energy. That is what we are referring  
14          to, is it?

15                  A. That is exactly what I'm referring  
16          to, yes.

17                  I might mention that the simulation  
18          experiments were written up in a report, and that that  
19          report was requested in numerous -- or the effective  
20          results of that sort of analysis were requested in  
21          numerous interrogatories. It is a fairly technical  
22          document. We didn't supply it with the material this  
23          morning, but if you want to find a copy, one of the  
24          responses that has it is 1.6.44. It explains the range  
25          of possible future outcomes that we explored to assess

1 the reasonableness of whether the primary load forecast  
2 band should be wider or narrower than the basic load  
3 forecast band.

4 Q. Now, having gone through all of that,  
5 I will take you back a little bit, take you back to  
6 what you talked about in terms of estimating the  
7 uncertainty associated with each of those terms on the  
8 right-hand side of the equation that you originally had  
9 up, and you described that as being a simple but  
10 powerful equation, I think was your term, developed  
11 specifically for the purposes of estimating  
12 uncertainty.

13 Why is it that when you've got all the --  
14 you've got the EEMO models; EEMO forecasting;  
15 residential, commercial, industrial; you've got the  
16 end-use models each doing those sectors. Why, instead  
17 of developing this separate equation and model  
18 specifically for uncertainty purposes, didn't you just  
19 use the EEMO and end-use models and simulate the  
20 uncertainty of all the right-hand variables of those  
21 models?

22 A. Okay. Well, I think to put that into  
23 context, I should make one or two statements about the  
24 philosophy of forecasting electricity demand, and how  
25 we have translated that into the development of the

1       uncertainty band itself.

2                       Certainly, the central concept in  
3       modelling electricity demand for the median case is  
4       that electricity is a derived demand; that people do  
5       not value electricity in and of itself, they value it  
6       for the services it provides. And essentially, in  
7       treating the concept of uncertainty, we have extended  
8       this concept to inferring the uncertainty in load from  
9       the uncertainty in the things that determine load.

10                      So that what Mr. Campbell is suggesting  
11       might seem eminently reasonable, that if we are  
12       determining load with these massive models, why don't  
13       we just simulate all of the components of those models  
14       to get a joint probability distribution for load from  
15       them, for the total system?

16                      The problem is that this is easier said  
17       than done, and it results from a statistical property  
18       in summing of variances. But essentially, you not only  
19       have to take into account the variance of any variable  
20       you might add to the modelling system we have put  
21       forward, you also have to take into account the  
22       correlation - I guess co-variance is really the correct  
23       term - between each of the explanatory variables when  
24       you combine them to get the joint probability  
25       distribution for load.

1                   Q. And each one, each relationship, if  
2                   there is a relationship between two of the variables,  
3                   it in turn, I take it, would have its own variability  
4                   that you would have to take into account?

5                   A. That is correct. Each pair-wise  
6                   relationship between the variables that explain load  
7                   has uncertainty associated with it, and each of those  
8                   would have to be analyzed and combined together to  
9                   produce the joint probability distribution.

10                  To give you a simple example of how this  
11                  works, if we were simply to add oil prices to our model  
12                  of GDP, just one variable, let alone, you know, the  
13                  dozens that exist in the various modelling systems we  
14                  have, we would have to take into account, as we have  
15                  now, with the uncertainty with GDP, and the uncertainty  
16                  with oil prices in future, we would also have to take  
17                  into account and develop distribution for the  
18                  relationship between oil prices and GDP in future.  
19                  That is, we would have to deal with the question of  
20                  whether high GDP in future is more likely to be  
21                  associated with low oil prices or high oil prices. And  
22                  there are various theories that abound in the world as  
23                  to where that relationship may go. Does demand drive  
24                  the oil price up, or do you only get high growth  
25                  because you have low oil prices?

1                   So the problem compounds itself, and this  
2                   is only a simple example of a one-step extension to the  
3                   modelling framework that we have provided.

4                   Q. I take it that, to do that would --  
5                   what you are dealing with here is not that, if you had  
6                   unlimited time and unlimited resources, you couldn't  
7                   embark on such an interesting exercise, but that, in  
8                   your judgment, is it a practical matter?

9                   A. I wouldn't want to say what we could  
10                  do with unlimited time and resources. It is not really  
11                  a practical matter, no.

12                 Q. All right. I want to take you then  
13                  back to the primary load forecast, and I'm going to ask  
14                  you just briefly to remind me and the panel what you do  
15                  when you are moving to the primary from the basic. And  
16                  again, I want you to talk here about what is involved  
17                  in that process, not the numbers.

18                 A. Essentially, just to remind you, in  
19                  moving to the primary load forecast from the basic, we  
20                  are subtracting out the planned net impact of the  
21                  electrical efficiency improvement programs, the load  
22                  shifting programs, and the load displacement  
23                  non-utility generation programs.

24                 Q. And that is demonstrated on chart 39  
25                  from Exhibit 100, is it?

A. That is correct. Essentially, what that shows is the layers of demand reduction associated with each of these program types, reducing the forecast for basic load in future.

Q. And again, speaking not so much to the values but just to the process, can you describe the kinds of judgments you have had to make in making that shift from the basic to the primary?

• • •

1 [12:15 p.m.] A. Okay. As I mentioned earlier, we  
2 have taken some care in developing the estimates for  
3 the various program types in such a way that they  
4 represent net reductions to the basic load forecast  
5 and I would like to look at why we feel that we have  
6 accomplished that for each of the program types, and I  
7 think I will start with load shifting.

8 Q. All right.

9 A. It's a fairly straightforward case,  
10 because, prior to 1989, there was absolutely no  
11 incentive in Ontario for people to do 16-hour load  
12 shifting. It's only with the introduction of the  
13 time-of-use rate structure, or, in subsequent years,  
14 perhaps the introduction of direct incentives for load  
15 shifting that someone would have any incentive at all  
16 to shift load off the full 16-hour peak.

17 And so we feel that the impact of load  
18 shifting is an incremental impact on peak. Our  
19 assumption is it will not, on net, affect energy  
20 requirements for the system.

21 Q. And when you say it's an incremental  
22 effect on peak; that is, it's something additional to  
23 consider when you're considering peak but, as I  
24 understand it, the purpose of the load shifting  
25 programs is not to put increments of load on peak, but

1       rather, just the opposite?

2                   A. Yes, it is an incremental reduction  
3       to peak.

4                   Q. All right. And then the second  
5       factor: energy efficiency improvements?

6                   A. The electrical efficiency improvement  
7       plan was developed with a series of technologies and  
8       measures which face, in our view, either economic or  
9       market barriers to penetration. As such, we feel that  
10      without some intervention by Ontario Hydro into the  
11      marketplace these technologies are unlikely to be  
12      adopted.

13                   Their cost is essentially uneconomic or  
14      there are other things that limits their take-up in the  
15      marketplace. And so, as the basic load forecast is  
16      essentially an extrapolation of what normally takes  
17      place in the market, we feel that they would not be  
18      captured by the basic load forecast.

19                   Now, in practice, it is quite possible  
20      that some non-economic efficiency improvement measures  
21      may be adopted by individuals; that is, something that  
22      doesn't offer a quick payout in terms of energy savings  
23      is, in fact, purchased and installed by someone in  
24      Ontario.

25                   At the same time, there are all kinds of

1 measures that are quite economic that people are not  
2 buying and installing, and we have made the simplifying  
3 assumption for the purpose of this forecast that those  
4 two factors offset each other; that is, the  
5 non-economic actions by people, those people who choose  
6 things that are not economic in the strict sense, and  
7 those people who don't choose things that are economic,  
8 that these balance out, and that the fundamentals of  
9 the electrical efficiency improvement forecast are set  
10 by the economic factors underlying the analysis of the  
11 options.

12 Now, as we gain more experience in the  
13 marketplace working with customers, we will get a  
14 better sense of whether that is an appropriate  
15 assumption or not, but it is the one we have made for  
16 the purpose of this forecast.

17 Q. All right. And the third item in  
18 that reduction from the basic to the load forecast is  
19 load displacement non-utility generation. And you had  
20 better perhaps briefly explain again what that is.

21 A. Yes. We've used the term a couple of  
22 times. The load displacement non-utility generation is  
23 that portion of non-utility generation which is  
24 self-generated by Ontario Hydro's customers and reduces  
25 their purchases from Ontario Hydro.

1                   When you look at our entire non-utility  
2 generation plan and forecasts, you find both load  
3 displacement non-utility generation and purchased  
4 non-utility generation.

5                   The second category refers to sales by  
6 non-utility generation -- non-utility generators to  
7 Ontario Hydro and those sorts of sales are treated as a  
8 supply resource for purposes of demand/supply planning.

9                   The load displacement non-utility  
10 generation is really the demand side of the non-utility  
11 generation business. It is the portion which reduces  
12 demand. We never see the kilowatthours, they just are  
13 taken off the system before people buy the electricity  
14 from us.

15                  Now, in fact, in Ontario, prior to the  
16 introduction of our programs, pretty well all  
17 non-utility generation was of the load displacement  
18 type; that is, there was about 1200 megawatts of  
19 non-utility generation where customers generated for  
20 their own purposes electricity and reduced demand that  
21 they would make on Ontario Hydro. And it's reasonable  
22 to expect that, in future, without Ontario Hydro's  
23 programs, there would be additional such load  
24 displacement non-utility generation.

25                  And the amount of that in future has been

1       estimated for us by our Non-Utility Generation  
2       Division, looking at the history of the installation of  
3       load displacement non-utility generation, and that  
4       amount has already been subtracted out of the basic  
5       load forecast.

6               What we are looking at in the primary  
7       load forecast is any additional load displacement  
8       non-utility generation that arises because of  
9       incentives Hydro offers and would not have taken place  
10      in the normal evolution of the market for load  
11      displacement non-utility generation. And that amount  
12      will be discussed on Panel 5 by the Non-Utility  
13      Generation people.

14             Q. All right. So what we're talking  
15      about there is you've got so much of this stuff  
16      happening anyway, your Hydro programs are going to  
17      provide an incremental amount, and it's only that  
18      incremental amount that is pertinent to the basic and  
19      primary difference, as I understand it?

20             A. That's correct.

21             Q. All right. And we'll get back to  
22      that, no doubt, on Panel 5.

23             Now, I would just like you to, just as a  
24      sort of preview of what is going to be discussed in  
25      those panels, just give the impact of the energy

1 efficiency improvement, load shifting and load  
2 displacement NUG programs in total on the basic load  
3 forecast, again remembering that the quantity of those  
4 amounts will be spoken to in Panels 4 and 5.

5 A. Yes. I simply want to indicate the  
6 impact results. I hope I'm not confusing people by the  
7 way I presented the numbers on page 40 of the exhibit,  
8 because the growth rates are actually given relative to  
9 the 1990 actuals and the load forecast documents give  
10 it relative to 1989, so that, if the numbers don't  
11 exactly line up with other numbers, it's because the  
12 base year is different. It makes a difference, because  
13 1990 turned out to be quite a weak year relative to the  
14 '89 projection for 1990.

15 The effect on peak, in the decade 1990 to  
16 2000, is to reduce the growth rate from 2.7 per cent to  
17 1.9 per cent and over the full 25-year planning horizon  
18 from 2.3 per cent to 1.9 per cent.

19 The impact on energy is less substantial  
20 and that is because the load shifting programs reduce  
21 peak but do not affect energy, so a certain proportion  
22 of the demand reduction is not translated into an  
23 energy change, and the growth rate changes then from  
24 the basic, it's 2.9 per cent for energy in the 1990 --  
25 starting from the 1990 actual, reduced to 2.3 per cent,

1 and over the whole 25 years of the plan, the 2.4 per  
2 cent growth rate for basic energy reduced to 2.0 by the  
3 effect of the programs that we have been discussing.

4 Turning to the next overhead. Looking at  
5 these things in level terms, I'll just focus on the  
6 change in peak. By the year 2000 and, in this case, I  
7 should say I'm following the convention in the  
8 demand/supply document of giving peak in terms of the  
9 January 20-minute peak, which is the peak used by  
10 System Planning for developing its plans.

11 The difference in the year 2000 is 2,800  
12 megawatts and the difference by the end of the period  
13 is 5,300 megawatts associated with the demand reduction  
14 programs.

15 Again, just to make it absolutely clear,  
16 the reason why the difference in the year 2000 is not  
17 larger is that because it's the January peak for the  
18 year 2000 and does not include the savings to be  
19 achieved in the year 2000 itself, which is worth a few  
20 hundred megawatts, if people are comparing the numbers  
21 very closely.

22 Q. All right.

23 A. Finally, just to complete the  
24 comparisons to the numbers supplied in the  
25 demand/supply document itself, the 1990 primary load

1 forecast for the year 2000 is 174 terawatthours, which  
2 is 1.8 per cent above the value given in the  
3 Demand/Supply Plan, and the number for the year 2010 is  
4 210 terawatthours, which is 4 per cent above the amount  
5 in the Demand/Supply Plan.

6 Q. All right. Now, there are just a  
7 couple of other matters I would like you to deal with,  
8 and the first of these has to do with the kind of  
9 judgments that have been made about the future in  
10 Ontario, and I guess I'd put it this way: In preparing  
11 the basic load forecast, have you made any judgment  
12 about the desirability or acceptability of particular  
13 futures, and thus the desirability or acceptability of  
14 the median forecast and its 80 per cent band width?

15 A. I think it's important to understand  
16 that the basic load forecast is not a chosen future, it  
17 is what Hydro expects will be the outcome, the time  
18 path for electricity demand, when we leave the economy  
19 to evolve as it currently operates, if we leave  
20 existing government policies and programs and  
21 regulations in place, if we take into account new  
22 government policies and programs that we may reasonably  
23 anticipate.

24 When we prepare the primary load  
25 forecasts, we make a statement about what we think we

1 can do to impact on load, through demand reduction  
2 efforts, and we do this assuming that the measures that  
3 we take are economic, assuming the availability of the  
4 major supply options that are before this Board.

5 This approach is in keeping with the  
6 strategy that Hydro announced in its demand/supply  
7 planning strategy and, as far as we know, with  
8 government policy.

9 There are certainly many risks to the  
10 forecast, and we discussed this morning the uncertainty  
11 band that we have estimated to reflect those. We feel  
12 that the band width forecast gives us confidence that  
13 the forecast we're using is appropriate for planning  
14 purposes.

15 Q. Now, in the face of uncertainty about  
16 the future, one response we've seen, certainly in the  
17 interrogatories, has been to question whether to use  
18 forecasts at all. Why not simply decide on a future  
19 which is, in some sense, defined as desirable or  
20 acceptable and simply say: That's what we're going to  
21 plan to meet for -- that's what we're going to plan to  
22 meet?

23 A. Well, it sounds straightforward  
24 enough, and as we discussed in the response to  
25 Interrogatory 1.6.29 there are, however, a whole host

1 of practical problems that must be recognized if one  
2 wishes to embark on an approach like this.

3 And the first is simply choosing what  
4 targets you are going to aim for. There are clearly a  
5 wide range of alternative visions for the future of  
6 Ontario; that is, the future structure of the province,  
7 the way its economy works, and some of these visions  
8 could lead to growth scenarios that admittedly are not  
9 encompassed by Hydro's band width.

10 It's part of the pervasive nature of the  
11 way electricity works in our economy, that in order to  
12 change the demand for electricity significantly in  
13 future, you may have to change the way the economy  
14 itself works and how it's structured.

15 Hydro does not feel it is its role to  
16 choose an alternative socio-economic framework for  
17 Ontario, and certainly we shouldn't be basing our  
18 planning on some alternative vision that we have  
19 selected.

20 If anybody is going to choose an  
21 alternative vision for the economic structure in  
22 Ontario, it's the Ontario government. And they should  
23 take the lead role in selecting that vision and guiding  
24 the province along the path towards it, and every once  
25 in a while, they're going to have to go to the

1       electorate to see if they agree with what they're doing  
2       over the period of time covered by this plan.

3               Once the government has formulated its  
4       views on economic structure, economic policy,  
5       environmental policy, energy policy, it certainly is  
6       empowered to instruct Hydro on its role in implementing  
7       those policies.

8               Q. Now, against that discussion, do you  
9       view it as any more feasible to target a particular  
10      load growth rate than to plan to kind of forecast that  
11      you have prepared?

12              A. Well, I would like to make a contrast  
13      really to a single-line forecast, which we have  
14      rejected as the basis for planning. We recognize a  
15      high degree of uncertainty in planning, but viewing a  
16      target as -- choosing a particular path for load, I  
17      think it behooves one to begin with to have a good  
18      sense of what load would otherwise have been without  
19      introducing any policy changes, and this is precisely  
20      the intent of the basic load forecast.

21              To aim at, for instance, zero per cent  
22      load growth from now until 2015 would not be a very  
23      great achievement, if in fact zero per cent growth is a  
24      reasonable forecast to make.

25              Q. That is, if that's what would have

1 happened anyway?

2 A. Exactly. If that's what would have  
3 happened without any changes. On the other hand,  
4 targeting zero per cent growth, if 3 per cent growth or  
5 2.3, which happens to be our number, was the base case  
6 of what would happen anyway, you're going to require a  
7 wide range of policy instruments to move the demand  
8 around and also you're going to have to understand very  
9 well how those policy instruments will impact on load.

10 Now, as I said, it's the objective of the  
11 basic load forecasts to indicate where load would go  
12 within the current policy environment, and we  
13 inherently recognize a high degree of uncertainty in  
14 doing that.

15 Targeting will not eliminate the  
16 uncertainty, targeting has to take place against a  
17 backdrop of uncertainty. We do not know exactly  
18 whether it is 2.3 per cent or 3.2 per cent that load  
19 will be in future, so setting a feasible target will  
20 require considerable flexibility and will, in fact, not  
21 reduce uncertainty at all.

22 To actually achieve a target, in my view,  
23 will take much more information about the future than  
24 is required to prepare a forecast.

25 ...

1 [12:39 p.m.] The additional information largely about  
2 how society will respond to the policy changes that are  
3 used to try to shift demand.

4 Before we start using some of these  
5 policy instruments, I think we should look at them  
6 fairly carefully. When we prepare the primary load  
7 forecast, we include the expected results of the demand  
8 management programs which we have talked about.

9 These programs have, built into them, a  
10 central assumption; and that is that we are going to  
11 maintain the quality of the energy services demanded by  
12 the customer in the forecast period. We will have just  
13 supplied the same services with less electricity  
14 inputs.

15 It would be a major change in philosophy  
16 if we decided to regulate the quality of the energy  
17 services themselves. It is one thing to set standards  
18 on the efficiency of a refrigerator, suggest what  
19 energy consumption should be for a given type and size  
20 of refrigerator. It is quite another to say what type  
21 and size of refrigerator you can have in your house.

22 And I believe that crosses a line in  
23 terms of regulation of the economy that we should think  
24 very carefully about, and it may be a line that is  
25 required to be crossed, if some of the targets that

1 people may have in mind are to be achieved. In fact,  
2 targeting is a very complex matter and, in many ways,  
3 raises issues that are quite intractable.

4 Q. Now, that, I think leads me to the  
5 last question that I want to ask you, which is simply  
6 to comment on the sensitivity of the load forecast to  
7 government policy.

8 A. As an agent of the Ontario  
9 government, Hydro, and the load forecast department at  
10 Hydro, attempts to anticipate the consequences of any  
11 known policy changes. It is clear that the government  
12 may pass legislation that could influence the evolution  
13 of the industrial structure in Ontario or regulate the  
14 way energy is used and, in particular, the way  
15 electricity is used in future. Such major changes of  
16 course have yet to be announced, and they are not  
17 included in this load forecast.

18 As we mentioned earlier, known  
19 regulations have been taken into account, such as the  
20 1991 Building Code and various appliance standards that  
21 are expected to come into effect up to 1994. But we  
22 have been reluctant to project further standards  
23 because the current standard-making process is,  
24 frankly, quite slow-moving and its results are very  
25 difficult to anticipate.

1                   However, we have to acknowledge that were  
2                   standards or codes to be significantly upgraded, there  
3                   would be a noticeable impact on load. And the way we  
4                   choose to take it into account, it would be basic load  
5                   that would be affected.

6                   I have to remember, though, in looking at  
7                   changes in standards, that there would be an offset in  
8                   terms of the reduced impact of Ontario Hydro's own  
9                   efficiency improvement programs.

10                  A certain proportion of what we  
11                  anticipate doing in that 2,000 megawatts of efficiency  
12                  improvement program between now and the year 2000 would  
13                  be perhaps replaced by a standard.

14                  And so, the difference really is in the  
15                  take-up, between what we estimate the program to  
16                  achieve and what the standard would hopefully get,  
17                  which is probably all of the incremental market in that  
18                  area.

19                  The fact that we have efficiency  
20                  improvement programs in the primary load forecast is  
21                  one of the reasons it is very difficult for us to  
22                  speculate much about standards, because if we were to  
23                  have, implicit in the basic load forecast, a set of  
24                  standards that varies from current practice, we would  
25                  effectively have to make sure that our efficiency

1 improvement programs that we are subtracting did not  
2 overlap with the standards that we are incorporating  
3 into the basic load forecast, or we would be  
4 double-counting.

5 Effectively, the intent is to indicate  
6 what our electrical efficiency improvement programs are  
7 aiming to achieve in that forecast and to speculate on  
8 where government standards will take us, and so to  
9 fiddle with the numbers in the electrical efficiency  
10 improvement forecast could be very confusing and  
11 misleading.

12 MR. B. CAMPBELL: And on that note, Mr.  
13 Chairman, that was the last question that I have of  
14 this panel, and they are now available for  
15 cross-examination.

16 DR. CONNELL: Perhaps I could just  
17 address a question to Mr. Burke about his concluding  
18 responses.

19 I am not sure, Mr. Burke, whether you and  
20 your colleagues always think exponentially, but,  
21 obviously, sometimes your forecasts are represented  
22 exponentially, as they were in the table on page 40.

23 If you let your mind wander far beyond 25  
24 years, however, it must become clear to you, as it  
25 would to everyone, that the exponential thinking about

1 electric power or about population or GDP or any other  
2 of the variables quickly becomes unfeasible. Your  
3 figure of 2.3 per cent for the 25-year period in the  
4 basic forecast turns into doubling roughly every 30  
5 years, which translates into a thousand-fold increment  
6 over a 300-year period.

7 I don't imagine any of us think that  
8 exponential growth over that kind of period could be  
9 contemplated.

10 What is your own thinking about  
11 exponential growth and where the limits are going to be  
12 drawn? And what is going to replace exponential  
13 thinking when we get into that longer term terrain?

14 MR. BURKE: Could I have overhead No. 39,  
15 please?

16 Effectively, yes, we have presented our  
17 numbers in terms of compound growth rates. I think if  
18 you look at the forecast, it is much closer to a  
19 straight line than it is to an exponential growth rate  
20 in the sense of what one thinks of with some sort of  
21 upward trajectory of increasing slope.

22 Essentially, our compound growth rate is  
23 a series of declining exponential growth rates. And  
24 the extension of that is that at some point, we will  
25 get to very low exponential growth rates.

1                   In fact, what we are doing in  
2     representing our forecast in terms of compound growth  
3     rates is simply a matter of convenience, but we could  
4     have -- I mean, this line is pretty straight. We could  
5     have done it with a straight line, too, and just  
6     represented the absolute growth over this period.

7                   We are not forecasting continuous  
8     exponential growth; we are forecasting declining  
9     exponential growth. And the trajectory, where it hits,  
10    I don't know. How long into the future, I don't know.

11                  But really, it comes to some of these  
12    basic questions that we were talking about -- Mr.  
13    Rothman was talking about population in Ontario: Will  
14    population in Ontario continue to grow or not? The  
15    natural rate of increase is not going to replace  
16    population in Ontario, so we really can choose; do we  
17    have immigration at certain levels or not?

18                  Those are the sorts of things that will  
19    determine whether demand for electricity will grow and  
20    the extent to which the declining exponential trends  
21    are either accentuated or diminished in future.

22                  MR. ROTHMAN: If I could just add  
23    briefly: I just support that view and as I said, we  
24    have a declining exponential growth rate in the  
25    economic forecast, and by the time we get to the end of

1       this forecast period, as I said, we have population  
2       growth rates down at less than 1 per cent per year.  
3       And we would expect them to continue to decline with a  
4       fertility rate staying as low as 1.7 children per  
5       woman.

6               DR. CONNELL: Again to Mr. Burke, I think  
7       it was in your testimony you suggested that the band  
8       width for variables such as GDP and population does  
9       narrow. You have suggested that the 25-year forecasts  
10      had narrower band widths than the five-year forecasts,  
11      for example.

12             MR. BURKE: No. I said the growth rates  
13      narrowed. The absolute band width widens linearly, at  
14      least linearly over time.

15             DR. CONNELL: Thank you.

16             Is that observation, in fact, vindicated  
17      by experience? That is, if you look at older  
18      forecasts, do you find that the experience tends to  
19      bear out that observation?

20             MR. BURKE: Are you asking whether  
21      previous forecasts have converged, or are you asking  
22      whether if we look historically at GDP growth itself,  
23      whether 25-year growth rates of GDP have very little  
24      variability associated with them?

25             DR. CONNELL: No. I am really asking

1       whether - and certainly, forecasts with your level of  
2       sophistication, you may not be able to track them back  
3       very far - but can you compare outcomes with forecasts,  
4       with respect to band width?

5                 MR. BURKE: Oh, do our forecasts of load  
6       fall within an 80 per cent band width that we would  
7       simulate using this methodology?

8                 DR. CONNELL: Yes.

9                 MR. BURKE: Yes. There was an  
10      interrogatory response. This is, I guess, the first of  
11      these matters that will prove interesting during the  
12      hearings is how quickly we can pull these out. But  
13      anyway, there was an interrogatory which asked about  
14      essentially ex post testing of the band width.

15                And we presented results for two specific  
16      years that we had looked at; that is, there were two  
17      challenging years, really - 1976, which represented a  
18      turning point in load growth rates for Ontario.  
19      Essentially, the period up to '76 was the 7 per cent  
20      growth era that one frequently still hears  
21      characterizing the utility industry; and the period  
22      subsequent to that was a 3 per cent growth period.

23                And what we found was that the band width  
24      that we would have estimated using this methodology did  
25      not capture that trend. It was somewhat outside the

1 the 80 per cent confidence limit.

2 That is the most significant turning  
3 point that has happened in the last 70 or 80 years of  
4 Ontario history of electricity. And I can't say I am  
5 overly surprised, but I would observe, as the  
6 interrogatory response did, that the model itself, the  
7 single-equation model was not forecasting the  
8 continuation of 7 per cent growth in the period from  
9 '76 through to 1990 as, in fact, the actual forecast at  
10 the time did.

11 And the 5 per cent growth rate that it  
12 forecasted - that is, if we are really simulating back  
13 to where we were back then - was within the 80 per cent  
14 band that was generated at that point in time.

15 And again, we did this in 1982, looking  
16 at what turned out to be a very fast-growing period in  
17 the mid-80s, to see whether the results for what are  
18 really a cyclical phenomenon, not a long term  
19 phenomenon, were captured within the band. And they  
20 are at the upper crust, I might say, but nonetheless,  
21 they are within the 80 per cent range of that band  
22 width based in 1982.

23 So, given that those two years were  
24 particularly difficult years to forecast from, as they  
25 represented turning points in the economy, I have a

1 certain confidence in this band. But I can't assess a  
2 25-year interval because we just don't have any way of  
3 replicating back that far.

4 DR. CONNELL: But the reason for the  
5 diminished growth in the band width is, I think you  
6 observed, because the cyclical fluctuations get ironed  
7 out over time.

8 MR. BURKE: Essentially, dampened out  
9 over time; correct.

10 DR. CONNELL: But if there were a trend  
11 that were not anticipated in any of your models, then  
12 obviously, that would be a perturbing factor.

13 MR. BURKE: Yes. At the back of Exhibit  
14 10, we made a comment that if there were an emerging  
15 trend, which we would now consider a low probability  
16 but high impact contingency, if it turned out to  
17 materialize something that, if we were looking, say, at  
18 energy prices now, and we would not include a  
19 particular price trajectory for oil or gas in the 80  
20 per cent band for energy today; but if we ended up way  
21 outside that band, it could change the picture.

22 And when we come back with a new  
23 forecast, based on the new information, we would have a  
24 different band and a different median. And we really  
25 can only deal with the information we have available to

1       us up to the present. And if something is a low  
2       probability event today, it isn't determining the 80  
3       per cent band for the future. As soon as it becomes  
4       more probable, it will start to affect the future.

5               MR. ROTHMAN: I think I could add --  
6       perhaps be a little helpful here.

7               And think back ten years ago from now.  
8       And the forecasts that were made ten years ago, in  
9       1981, 1980, for 1990 and 1991, were to some extent  
10      rejected in the interim period, largely because of the  
11      recessionary impact in '81 and '82. So, we lowered the  
12      forecasts that had been made at that time of the  
13      decade's growth.

14              But if we go back now and look at those  
15      forecasts again, those forecasts have tracked, really,  
16      reasonably well and their errors are now looking  
17      relatively small, certainly smaller than they were,  
18      say, three or four years after the forecast was made.  
19      And certainly smaller than one or two years after the  
20      forecast was made.

21              That is the kind of consideration that  
22      was taken into account when we said that this notion of  
23      a band width always getting much wider is probably  
24      incorrect.

25              As Mr. Burke has said, if we go back far

1 enough to the forecasts that occurred before the break  
2 in trend, those forecasts have become increasingly far  
3 away. But forecasts made after that break in trend,  
4 even though they were changed subsequent to their  
5 original construction, seem to have captured that trend  
6 over that period pretty well.

7 DR. CONNELL: Thank you.

8 I have a question for Ms. Buja-Bijunas  
9 focussing on your comments on the pulp and paper  
10 industry. And I noted your comment that there may be,  
11 I think, a competitive advantage for U.S.-based  
12 recycling mills which are close to markets.

13 I don't think I detected in your  
14 presentation of a closely related factor that -- I  
15 think much of Canadian newsprint is, in fact, exported.  
16 I don't have the figure in mind.

17 DR. BUJA-BIJUNAS: Very much so, yes.  
18 One has to consider the fact that it is quite true,  
19 most of the newsprint from Ontario goes down to the  
20 United States. And so the recycled waste paper, the  
21 source of it, is actually down there.

22 DR. CONNELL: Yes. So, in fact, if  
23 Canadian mills are going to be competitive in the  
24 recycled market, it will have to be, to some extent,  
25 with imported, used newsprint; is that correct?

1 DR. BUJA-BIJUNAS: There are two sources,  
2 either local sources or imported, but you are quite  
3 right, one can look to both alternatives for supplying  
4 the recycled fibre required. So, there is that  
5 additional transportation cost.

6 DR. CONNELL: So, the Canadian mills will  
7 have to compete for the used newsprint as well as  
8 compete in the U.S. market?

9 DR. BUJA-BIJUNAS: That's correct, yes,  
10 that's right.

11 DR. CONNELL: Yes. But your projections  
12 of the proportion of recycled fibre from Canadian  
13 suppliers takes both those consideration into effect,  
14 does it?

15 DR. BUJA-BIJUNAS: That's right, yes.

16 DR. CONNELL: I wanted to ask a question  
17 about your iron and steel presentation, too,  
18 particularly with the introduction of the new  
19 technology that you cited, which might lead to  
20 substantial increases in electric power intensity.

21 Do those trends, if they materialize as  
22 you expect, are they also likely to increase their  
23 dependence on load displacement NUG or not, or that is  
24 not predictable?  
25

...

1 [12:58 p.m.] DR. BUJA-BIJUNAS: The question is is the  
2 adoption of, for example, electric arc furnace  
3 technology concomitant with the use of greater load  
4 displacement NUGs.

5 DR. CONNELL: Yes, the companies you  
6 cited, for example, are they companies which tend to be  
7 dependent on their own NUG?

8 DR. BUJA-BIJUNAS: The mini-mills are the  
9 ones that use electric arc furnaces, and they are not  
10 cogenerators. And so load displacement would not be an  
11 issue here.

12 Usually cogenerators are things like pulp  
13 and paper mills. In the purchasing of pulp, you need  
14 low pressure steam. And what is usually done is that  
15 you produce high pressure steam first, and you use that  
16 to drive turbines, generate electricity and convert the  
17 high pressure steam to low pressure steam, which is  
18 then used in the process, pulping also. So, whether or  
19 not do you cogeneration is a function of what it is you  
20 do. And that is not the case with scrap melting in  
21 electric arc furnaces.

22 DR. CONNELL: Finally, I'd like to bring  
23 together two points, comments on gas use and  
24 accessibility to gas in the residential area, and also  
25 Mr. Burke's final comments on government policy.

1 I think there has already been some  
2 indication of a trend in government policy with respect  
3 to space heating. Has that been incorporated in your  
4 forecast as yet?

5 DR. BUJA-BIJUNAS: That has not been  
6 incorporated into our forecast, but we have done an  
7 estimation. The policy in question is one in which all  
8 low income housing would be mandated to use gas as a  
9 space heating and water heating alternative. And that  
10 would be brought about by raising, basically, the  
11 maximum cost per unit, so as to allow gas to be a  
12 competitive supplier. Right now baseboards are used an  
13 awful lot, because baseboards have a very low capital  
14 cost. So it makes a low income housing unit relatively  
15 inexpensive.

16 In addition, low income units do not  
17 normally have the air conditioning, and so you don't  
18 normally need ducting and things like that, again  
19 making baseboards a very viable alternative.

20 We have done an estimation, I don't have  
21 the figure with me right now, but it is something we  
22 are considering for the next load forecasting update,  
23 but it has not been incorporated in the 1990 update,  
24 since the details were not available at that time.

25 DR. CONNELL: Thank you.

1 THE CHAIRMAN: We will break now until  
2 2:30.

3 Will you be ready to start at 2:30?

4 MR. RODGER: Yes, Mr. Chairman.

5 THE REGISTRAR: This hearing will adjourn  
6 until 2:30.

7 ---Recess at 1:02 p.m.

8 ---On resuming at 2:34 p.m.

9 THE REGISTRAR: This hearing is again in  
10 session. Please be seated.

11 THE CHAIRMAN: Mr. Campbell?

12 MR. B. CAMPBELL: Mr. Chairman, I just  
13 thought I should record the interrogatory number that  
14 Mr. Burke was referring to in his questions from Dr.  
15 Connell with respect to the ex post performance of the  
16 uncertainty band. The interrogatory number referred to  
17 is 1.14.36.

18 THE CHAIRMAN: Thank you.

19 Mr. Rodger?

20 MR. RODGER: Thank you, Mr. Chairman.

21 Good afternoon, panel.

22 Before I start, I have given the clerk a  
23 group of five interrogatories which I may be referring  
24 to in my cross-examination. These interrogatories are  
25 1.24.11, 1.24.9, 1.24.33, 1.24.29, 1.24.46.

1 THE CHAIRMAN: Have you given those to  
2 the panel as well?

3 MR. RODGER: Yes, I have given it to the  
4 clerk.

5 Perhaps we would call this exhibit  
6 interrogatories referred to by AMPCO in Panel 1  
7 cross-examination.

8 THE CHAIRMAN: Do they need to be put in  
9 as an exhibit? They are already recorded. Is there  
10 any need to put them in as exhibit?

11 MR. RODGER: I would suggest that this  
12 might be the appropriate way to proceed. If they are  
13 already in the record, that is fine with us.

14 THE CHAIRMAN: Well, they are in the  
15 record. They are not themselves evidence until they  
16 are used in some fashion under the strict rules.  
17 Interrogatories are not evidence.

18 MR. RODGER: I can put them --

19 THE CHAIRMAN: You can put them in, if  
20 you want to read them in. Is that what you are doing?  
21 In effect you are reading those in as part of your  
22 evidence?

23 MR. RODGER: Yes, I was going to refer to  
24 them during my cross-examination, but I can put them in  
25 each one at a time as I...

1 THE CHAIRMAN: You don't need to do that.  
2 If that is the way you'd like to do it, we will just  
3 take it and put them in as an exhibit, and that will be  
4 that.

5 MR. RODGER: Okay. I have got a few  
6 extra copies for my friends. Perhaps they could share  
7 them among themselves.

8 THE REGISTRAR: 102.

9 THE CHAIRMAN: 102; collectively, I take  
10 it? These are all going in collectively, as one  
11 exhibit?

12 MR. RODGER: That is right, Mr. Chairman.

13 MR. D. POCH: Mr. Chairman, if I could  
14 just interrupt on that point before we get going, a  
15 suggestion perhaps that the Panel could consider.

16 The practice that evolves at the OEB  
17 where there is also a tremendous number of  
18 interrogatories, not all of which are going to  
19 ultimately get referred to in oral evidence, but which  
20 may be important in that someone wants to rely on them  
21 for argument or for their own evidence in-chief, is to  
22 have the witnesses simply indicate that they were  
23 responsible for preparing or overseeing all the  
24 interrogatories exhibits pertaining to such-and-such a  
25 panel, and they thereby adopt them as their evidence.

1                   Now no one assumes by that that the Panel  
2                   will have seen that evidence, but then at least we  
3                   don't have the problem, if we refer to them later, of  
4                   anyone suggesting that they aren't Hydro's evidence.

5                   THE CHAIRMAN: Mr. Campbell is shaking  
6                   his head vigorously at that that.

7                   MR. B. CAMPBELL: I think, given the  
8                   number of interrogatories that we are dealing with  
9                   here, to put them all in automatically and have them as  
10                  exhibits in evidence in the hearing has not been the  
11                  basis on which we are proceeding.

12                  We are trying to provide answers as best  
13                  we can, but we have always taken the position, and have  
14                  proceeded on the understanding, that these matters were  
15                  not just sort of automatically being relied on. It is  
16                  a very great concern to us, because sometimes how  
17                  information is used is as important as the pure  
18                  information itself.

19                  We saw this morning, for instance, that  
20                  it is important to understand precisely which numbers  
21                  are running from which dates and this and that, and  
22                  sometimes that is not at all -- if a number is then  
23                  just taken out somewhere out of this mass of  
24                  interrogatories and treated as evidence, all of that  
25                  disappears. And that is not the way that we have

1        tried -- not the basis on which we have been answering  
2        interrogatories.

3                We had understood and have prepared on  
4        the basis that interrogatory answers would come on to  
5        the record of the proceedings in two ways. One is  
6        through the time -- at the time the panel was here, and  
7        subsequently at the time that parties were presenting  
8        their cases, they would indicate where from the  
9        interrogatories they had taken certain information from  
10       the preparation of their case. But I...

11               THE CHAIRMAN: One other third thing is  
12       cannot parties put in interrogatories that they have  
13       received as part of their case?

14               MR. B. CAMPBELL: Yes, that was the  
15       second one.

16               THE CHAIRMAN: When they are giving their  
17       evidence, I mean.

18               MR. B. CAMPBELL: Yes, and then we can  
19       see how that information has been used, and we can make  
20       a judgment as to whether it has been used  
21       appropriately. That was really the second instance  
22       that I spoke of.

23               THE CHAIRMAN: What about another party  
24       putting in an interrogatory in response to another  
25       party? What about that?

1                   MR. B. CAMPBELL: We have no objection to  
2                   that. We don't try and tailor our answers to  
3                   different -- depending on who is asking the question.  
4                   We just try and sort of answer the questions. What I'm  
5                   concerned about is just this holus bolus importation of  
6                   5,000 questions so far into the evidence.

7                   THE CHAIRMAN: Well, I understand that  
8                   point. What about when Mr. Burke says, "And that is in  
9                   Interrogatory 1.10.52," or something like that? Does  
10                  that then make it part of the evidence? I would assume  
11                  it does.

12                 MR. B. CAMPBELL: Yes, I think that is  
13                  correct.

14                 THE CHAIRMAN: Or that is an exhibit.  
15                  Exhibits, of course, are part of the evidence.

16                 Well, all right, I guess the only real  
17                  issue in your mind, at least, is that whether or not  
18                  when Mr. Rodger comes along now, whether we should make  
19                  these a separate exhibit or just simply treat it as  
20                  part of the evidence, once he says that is what he  
21                  wants. I take it you are number 24, Mr. Rodger?

22                 MR. RODGER: That is correct.

23                 THE CHAIRMAN: He wants these as part of  
24                  the evidence; he can do that now or later.

25                 MR. B. CAMPBELL: That is right. He's

1 going to use them in cross-examination, and the panel  
2 will have an opportunity to deal with them, as Mr.  
3 Rodger may hope to rely on them. Or if Mr. Rodger  
4 subsequently has other interrogatories that he uses in  
5 the course of preparing his case, we would then see  
6 that.

7 I'm just very concerned about simply  
8 making, automatically, an exhibit in evidence in these  
9 proceedings, the huge bulk of interrogatories. I  
10 thought the whole purpose, and we had been proceeding  
11 on the basis, and quite frankly have been answering  
12 interrogatories, and we have sort of given up on  
13 contesting matters of relevance, et cetera, and  
14 materiality, simply on the basis that the understanding  
15 was that all of those points would be dealt with at the  
16 time that they were imported into the evidence in one  
17 of the several ways that we have talked about.

18 THE CHAIRMAN: Thank you.

19 Is there anyone else that wants to make a  
20 submission on this particular issue? Mr. Shepherd?

21 MR. SHEPHARD: Mr. Chairman, just a point  
22 of clarification, I don't want to take up any time. If  
23 Mr. Burke refers to an interrogatory that he has not  
24 filed as an exhibit, as he did with 1.14.34 --

25 MR. BURKE: 36.

1                   MR. SHEPHARD: Or 36, whatever, does it  
2 then have to be put in as an exhibit to be part of the  
3 evidence? Or is his reference to it then--

4                   THE CHAIRMAN: I wouldn't think so.

5                   MR. SHEPHARD: --that is it.

6                   THE CHAIRMAN: I'm taking a simplistic  
7 view. If an interrogatory is referred to, subject to  
8 anyone saying otherwise about it, it becomes parts of  
9 the evidence.

10                  MR. SHEPHARD: Well, I wonder whether the  
11 conclusion from that then is that we don't have to put  
12 any in as exhibits, because once the number is on the  
13 record, that is the end of it.

14                  THE CHAIRMAN: I think that is the  
15 conclusion. We don't need to put them in as separate  
16 exhibits.

17                  So, from now until someone tells me that  
18 is not an appropriate rule, if interrogatories are  
19 referred to by a witness or is asked to be put in as  
20 part of the evidence of a party, be it his own or  
21 somebody else's, that becomes evidence in this hearing  
22 which we consider. But there is no blanket blessing on  
23 all interrogatories.

24                  I think that is, for convenience myself  
25 at least, in this early stage, I wouldn't want to think

1       that in addition to everything else we have to hear, I  
2       have to pour through interrogatories that nobody has  
3       referred to. So, I think we will leave it that way for  
4       now.

5                     Mr. Rodger?

6                     Yes, there is a problem? I have done  
7       something wrong.

8                     MS. MORRISON: I think the only pressing  
9       reason to put them in as a group as an exhibit, so that  
10      people will feel obliged to bring copies to the hearing  
11      if they are going to refer to them.

12                    If it is just a matter that you can just  
13      refer to numbers all over the place, I don't think they  
14      will be provided in an organized way each day when  
15      people are going to refer to them. If people would  
16      undertake to do that, I have no interest in them being  
17      exhibits in packages, except to make sure that the  
18      panel gets a package of them. That was the reason for  
19      the attempt to put them in that way.

20                    THE CHAIRMAN: Well, all right, but as  
21      long as people know that that is what we'd like to have  
22      happen, can we do it the way I suggested?

23                    I think what Mr. Rodger has done is  
24      exactly the right way. First of all, he's alerted the  
25      Panel in advance of his examination of the ones he

1 intends to refer to, so that they at least have had,  
2 perhaps not very much time, but at least some time to  
3 know what it is that he's interested in, and he's  
4 provided us with copies, and that is a very good way of  
5 doing it, mind you.

6 MS. PATTERSON: So we strike 102?

7 THE CHAIRMAN: We strike Exhibit 102.

8 Is everyone on side?

9 All right, Mr. Rodger.

10 MR. RODGER: Thank you, Mr. Chairman.

11 CROSS EXAMINATION BY MR. RODGER:

12 Q. Mr. Rothman, if I could start by  
13 reviewing a few of your comments of yesterday's  
14 testimony.

15 You discussed how the long term economic  
16 forecast works its way through the system at Hydro.  
17 And I believe you made reference that after it is  
18 complete, I'm not sure what level this is, it either  
19 goes to a VP in corporate planning, and then on to an  
20 executive committee.

21 I didn't quite understand that. I wonder  
22 if you'd clarify the process by which the forecast is  
23 approved?

24 MR. ROTHMAN: A. Sure. I review the  
25 forecast and recommend its approval to the

1 vice-president of corporate planning, who is my  
2 immediate superior. In effect I send him a memo  
3 saying, "Here is the new forecast, please approve it,"  
4 and there is a line on the bottom of the memo for his  
5 signature.

6 He reviews it and approves it or sends it  
7 back with comments, as the case may be, and once he  
8 approves it, it is approved for use throughout the  
9 corporation.

10 Q. In your experience, what is the  
11 nature of the comments that the VP of corporate  
12 planning only send it back to you, and what are the  
13 nature of the comments?

14 A. He's never sent it back to me with  
15 any comments accept his signature. I mean we usually  
16 have some discussion about it, or he may make some  
17 comments on the content to me about what his opinions  
18 are or where he thinks -- some comment on its content,  
19 but it has never been sent back to me for revision. It  
20 has always been approved as I recommended it to him.

21 Q. So when does the vice-president of  
22 corporate planning, when does he actually see the  
23 forecast? Does he have an ongoing participation in  
24 this, or do you see it right up until the end, and then  
25 he rubber stamps it?

1                   A. The procedure has varied with the  
2 vice-president and his particular interests.

3                   When Mr. McConnell was vice-president, he  
4 generally saw it at the end. I would usually have some  
5 discussions with him about its general shape and  
6 direction, more in the way of one-way information than  
7 two-way information. But he wouldn't see the final  
8 product until it was sent to him for approval and would  
9 not have seen details until it was sent to him for  
10 approval.

11                  Mr. Holt, as vice-president, has taken a  
12 more active interest in the process. And I mentioned  
13 that we have an external advisory committee meeting.  
14 Mr. Holt has been very interested in those, and he has  
15 attended them, again, for one-way information to him.  
16 I think he's been quite interested in what we have said  
17 to our external advisors, and in particular what they  
18 have said to us.

19                  I might add I think he's been fairly  
20 impressed with the level of the discussion at the  
21 meetings, and with the degree of respect that our  
22 advisors have shown our forecast.

23                  Q. For this latest long-term forecast,  
24 the 1990 forecast, what were the comments, if any, of  
25 the vice-president, when you submitted it to him?

1                   A. Not to be truthful, I don't remember  
2                   that he said anything in particular. I think, as I  
3                   recall, I sent him the memo, and I got it back within a  
4                   few days, signed.

5                   Q. In your experience working with  
6                   Ontario Hydro, do factors such as recessions or a  
7                   change in government, does that have an impact on that  
8                   approval or amending of that long-term forecast?

9                   A. No.

10                  Q. Now you also said yesterday that...

11                  MR. B. CAMPBELL: Sorry, just on the last  
12                  question. I have taken the question to mean does it  
13                  have an impact on that final step, where it is  
14                  officially sent and signed. I assume you are not...

15                  THE CHAIRMAN: I think that is what the  
16                  question was. It was on a comment.

17                  MR. RODGER: Yes, it was.

18                  MR. B. CAMPBELL: As long as it wasn't  
19                  taken to be the whole process.

20                  MR. RODGER: No.

21                  Q. Yesterday you also talked about the  
22                  productivity growth and how that means a growth per  
23                  worker. And you said that during the 1970s  
24                  productivity growth fell, due to high inflation and  
25                  high energy prices. And that in the 1980s productivity

1 growth increased, because energy prices were lower.

2 When we speak of an increase or decrease  
3 in energy prices, is that -- and in terms of it  
4 affecting productivity, do those fluctuations in price,  
5 does that just apply to natural gas or oil, or is  
6 electricity also included in that?

7 MR. ROTHMAN: A. I was thinking  
8 primarily of natural gas and oil, because they, in an  
9 aggregate sense, are much more important fuel sources.  
10 There is an extent to which it applies to electricity  
11 as well.

12 The argument, part of the argument about  
13 why energy prices reduce productivity growth is that an  
14 unexpected rapid increase in energy prices can make  
15 energy-using capital equipment unexpectedly obsolete,  
16 in effect, reducing the effective total of capital in  
17 the economy.

18  
19  
20  
21  
22  
23 ...

1 [2:50 p.m.] Electricity-using capital equipment can  
2 also have a similar impact although, in general, the  
3 energy costs for using that capital equipment are  
4 smaller for electricity-using capital equipment than  
5 they are for the fossil fuel-using capital equipment.

6 Q. But electricity prices could have the  
7 same impact as fluctuations in gas and oil?

8 A. Yes, especially if there were large  
9 changes in real prices over short periods of time.

10 Q. That's the point I'm trying to get  
11 at. If, for whatever reason, there was a decision that  
12 current electricity prices should be twice or three  
13 times their current levels, would it be your  
14 understanding that the impact of that would be lower  
15 productivity growth?

16 A. I would think that would be right,  
17 but I would also think that it would depend very much  
18 on how such a price increase were implemented.

19 Q. I'm sorry, did you say it wouldn't be  
20 right or it would be right?

21 A. Would be right. But I would think it  
22 would depend -- the size of the impact would depend  
23 very much on how such an electricity price were  
24 implemented.

25 If it were implemented with adequate

1 notice over a reasonably long period of time, then I  
2 think its impact would be minimal. Companies would  
3 have time to adjust, they would have time to reorder  
4 their capital equipment or to adjust their capital  
5 equipment, they would have time to ensure that new  
6 capital equipment was optimized for the new set of  
7 relative prices coming in. So that the impact wouldn't  
8 be great.

9 I'm saying if you implemented it over --  
10 if you're saying a doubling of energy prices, if it  
11 were done, say, over 10 years so that it were 10 per  
12 cent extra in real terms per year, that would have a  
13 much smaller impact than if you made a 100 per cent  
14 increase in electricity prices in one year.

15 It also will make a difference as to how  
16 much notice firms are given. If you tell the firms:  
17 Starting in two years real electricity prices will  
18 increase 10 per cent every year, no more, no less, that  
19 produces a different reaction than if real electricity  
20 prices increase a hundred per cent next year with three  
21 months' notice and then don't increase at all for a  
22 year, and then increase, say, 50 per cent in a third  
23 year, again, with three months' notice.

24 That kind of instability in prices is  
25 also damaging, in fact it can be damaging even if

1 prices fall rapidly. It's simply volatility in prices  
2 can have negative effects on productivity.

3 Q. When you discussed just now that if  
4 let's say you give industry two years' notice and in  
5 two years time electricity prices are going to double,  
6 as an economist in a planning process, one of the  
7 considerations that you would look at is that industry  
8 would say: Well, if I have to put out "x" number of  
9 dollars to change my capital equipment and the price of  
10 electricity is going to be double, at some point it may  
11 not be worth the while of industry to invest in that  
12 new equipment because the price of electricity would  
13 make it uneconomic.

14 Is that a kind of consideration that you  
15 would take into account?

16 A. Sure. I said that the more notice  
17 you get, the easier it is to plan, but the more  
18 abruptly the prices change, the more negative it is on  
19 productivity.

20 I would expect also that if we were to  
21 announce that large an increase in prices in a short  
22 period of time it might well affect things like  
23 locational decisions or decisions as to whether or not  
24 to put the money into the capital at all.

25 As Mr. Burke cautioned during his

1 evidence in-chief, that large an increase in  
2 electricity prices is outside the range of the  
3 historical experience that we've had, so it would be  
4 difficult for us to estimate quantitatively how large  
5 an impact that would have on electricity demand.

6 But Mr. Burke also suggested that such  
7 large increases in electricity prices could have an  
8 impact on economic activity, and that would be a  
9 complicated factor in estimating their impact.

10 Q. Now, you also said yesterday that  
11 Hydro is predicting that productivity growth will  
12 accelerate in the future, and I take it that implicit  
13 in that -- given your comments just now about the  
14 increase in price, implicit in your prediction that  
15 productivity growth will rise, that you're assuming  
16 that prices of electricity will remain stable over the  
17 long term and we won't have these substantial increases  
18 or possibly doubling or tripling of rates?

19 A. Yes. I testified that our forecast  
20 of electricity prices is for real price increases over  
21 the next four years or so followed by a period of  
22 stable prices.

23 Q. Now, I believe you said yesterday  
24 that once Hydro has completed its long-term economic  
25 forecast, that it compares that forecast with other

1 forecasts that are available; is that right?

2 A. It's more a continuous process than  
3 that. We look at other forecasts at the time that  
4 we're preparing them - our own - and we look at them  
5 afterwards as well.

6 I mentioned Informetrica as the only  
7 regular supplier of long-term Ontario forecasts.  
8 Informetrica is an economics consulting and forecast  
9 firm, they sell that forecast to anyone who wants to  
10 buy it, and Ontario Hydro is a subscriber to that  
11 forecast. So we use their forecast and their forecast  
12 information as one of our inputs, as well as a check  
13 once we've made our forecast.

14 Q. And is this -- was it Informetrica,  
15 is that...?

16 A. Yes. I-n-f-o-r-m-e-t-r-i-c-a.

17 Q. And it's a long-term forecast?

18 A. Yes.

19 Q. And how long have you been comparing  
20 Hydro's forecast with this analysis?

21 A. We've been subscribers to  
22 Informetrica since I came to Hydro in 1982.

23 Q. And generally, how does Hydro's  
24 forecast compare with this Informetrica model?

25 A. It's hard to categorize it over a

1 long period of time. In general, Informetrica is an  
2 optimistic forecaster and I think our forecasts have  
3 generally been a little bit lower than theirs.

4 Q. When you say it's a more optimistic  
5 forecaster, what do you mean by that? What are the  
6 differences in the two approaches?

7 A. It's hard to be precise about what  
8 the differences are. Informetrica primarily focuses on  
9 Canada as a whole rather than on Ontario as we do, so  
10 their concern is more with Canada-wide trends than ours  
11 is. So it's, in a way, hard to tell what the  
12 difference in approaches is.

13 In general, the difference is that they  
14 have in the past seen some possibilities for Canada,  
15 some of which we mention as risks, as the most likely.

16 For one example, a couple of years ago  
17 Informetrica was forecasting that there would be, by  
18 the mid-90s, a world-wide shortage of certain  
19 resource-based materials that Canada exports, like some  
20 of the non-ferrous metals that Canada exports, and pulp  
21 and paper, forest products. Those world-wide shortages  
22 would produce a favourable change in the terms of  
23 trade, in favour of Canada. It would turn Canada into  
24 a significant capital-exporting country and would  
25 significantly improve conditions in Canada because we

1 could trade our goods to foreigners for more of their  
2 goods than we can currently get.

3 That is a forecast that not many  
4 people -- with which not many people agreed, and it's  
5 not one with which we currently agree.

6 Q. Does this model, although it looks at  
7 Canada as a whole, does it focus in on Ontario  
8 specifically for any part of its analysis?

9 A. Their model is a large-scale  
10 econometric model that gets to the industry level by  
11 using an input/output analysis. They then get to the  
12 Ontario level, essentially, as a satellite model off  
13 their Canada-wide model.

14 That is why I said that we're the only  
15 people that I know who have a long-run econometric  
16 model of Ontario. The Informetrica model is an  
17 econometric model of Canada which runs Ontario as a  
18 satellite off the results that it gets.

19 Q. And what's been the difference  
20 between your model and Informetrica? You said that the  
21 Informetrica was more optimistic. What does that mean  
22 in the differences in the estimates?

23 A. I can't tell you off the top of the  
24 my head.

25 Q. What's the source of the data that

1 Informetrica uses to base its forecast on?

2 A. The same source as we use, Statistics  
3 Canada.

4 Q. StatsCan. So there's no other  
5 long-term forecast that you could compare your  
6 long-term forecast to?

7 A. Not beyond 2000. DRI and WEFA, the  
8 Wharton Econometric Forecasting Association both have  
9 forecasts to the year 2000.

10 Q. Are these private consulting firms  
11 that come up with these forecasts as well?

12 A. They're both private consulting firms  
13 and forecast-sellers, yes.

14 Q. And their forecast goes up to 2000,  
15 so is it a 10-year forecast or a five-year forecast?

16 A. Their forecast is essentially a  
17 10-year forecast.

18 Q. Is there any comparison made with  
19 these two forecasts with Hydro's, either their  
20 short-term or their long-term forecast?

21 A. Again, we are subscribers to DRI and  
22 we, therefore, look at their forecasts. But, again,  
23 their forecasts are primarily Canada-wide forecasts,  
24 neither of them has currently a separate Ontario model.  
25 They run Ontario essentially as shares off their

1 national forecast. We look at them, yes.

2 WEFA we don't get on a regular basis of  
3 course because we don't subscribe to them, DRI we do  
4 get on a regular basis.

5 Q. And what would be the differences in  
6 these other two models you mentioned, the DRI and the  
7 Wharton as compared to, say let's, your short-term  
8 model since it's closer, it's about five years?

9 A. Well, we use the DRI model for our  
10 Canada forecast. As I said, we subscribe to that model  
11 and its model is used to produce our Canada-wide  
12 forecast.

13 Q. Maybe I am getting ahead of myself  
14 here, but I'm assuming that these models that we have  
15 talked about, the Informetrica, the DRI and the  
16 Wharton, they all kind of produce the same end result  
17 as your long-term forecast.

18 Is that a correct assumption on my part,  
19 or are they different somehow?

20 A. What do you mean by the same end  
21 result; do you mean the same numbers, the same values  
22 of the variables, or the same variables?

23 Q. Yes. The same variables in terms of,  
24 at the end of their forecast they're saying GDP, in  
25 effect, is going to be this or it's going to increase

1 or decrease by this amount?

2 A. Yes, they will all forecast the same  
3 kind of macro variables.

4 Q. Does the Government of Ontario has it  
5 now or did it ever do a long-range economic forecast?

6 A. We've never seen numbers. They've  
7 never published numbers for longer than five years or  
8 so. I am not aware of any long-run economic  
9 forecasting that they're doing.

10 Q. From a planning point of view would  
11 you find it helpful as an economist if, let's say the  
12 Government of Ontario, were to do an independent, as it  
13 were, long-term forecast with which you could compare  
14 your analysis?

15 A. It's helpful to have anybody's  
16 forecast with which to compare our analysis.

17 Q. Now, another model that you  
18 mentioned, yesterday I believe, was called LISA?

19 A. Yes.

20 Q. And you said that this model was  
21 developed by Hydro in 1989 for the 1990 forecast?

22 A. We started developing it in 1989 and  
23 we first used it in 1990.

24 Q. Could you just tell me a bit more  
25 about that particular model?

1 A. What?

2 Q. I didn't understand yesterday how  
3 that was different from -- is that a long-term model as  
4 well?

5 A. Yes.

6 Q. So, you have the results, I take it,  
7 if you developed it in '89 for the '90 forecast and you  
8 now have the 1990 actual figures of what happened in  
9 that year, how does that LISA model for '90 compare  
10 with the actual figures?

11 A. I don't know. My guess is that it  
12 probably missed the extent of the downturn.

13 Q. So...

14 A. In fact, I would be upset if it  
15 didn't.

16 Q. So I take it from your answer that  
17 you don't go back and check those past performance of  
18 the models?

19 A. I haven't done it. I don't know,  
20 frankly, whether my staff have done that directly. As  
21 I said, LISA is a long-term model and it's intended to  
22 be a long-term model. I don't know whether we have  
23 checked it against, you know, one-year history.

24 We're about to do another round, and so I  
25 wouldn't be surprised, I would expect that at the time

1 of doing the next forecast one of the first things you  
2 do is go back and see how the last one did. But we  
3 haven't done that yet, as far as I know, or if we have,  
4 I haven't heard about its results.

5 Q. Do you think there would be value for  
6 Ontario Hydro in a policy where you do go back and  
7 check your track record if even if it was just for a  
8 one-year forecast to see how it compares with the  
9 actual numbers?

10 A. Oh sure, as I said, I would expect  
11 that we would do that.

12 Q. Now, one thing, a quote you said  
13 regarding this LISA model and I just didn't understand  
14 it. You said that, "the model formed well in its  
15 construction."

16 And I'm just not sure what that means?

17 A. All right. Well, when you build a  
18 model, especially a long-term model, it is hard to know  
19 how well it's going to perform, you have to wait, kind  
20 of five years or more, to get a real good feel for  
21 whether its five-year forecast, its long-term forecast  
22 was accurate, but you're going to have to start  
23 trusting the model sooner than five years from now.

24 So, what you do is look at the kind of  
25 tests you can make on how well the model fits the past,

1 in effect: How well does the model do in explaining  
2 the past, that history from which it was constructed,  
3 and in those terms the LISA model has performed well.

4 Q. And what kind of tests are those that  
5 you're talking about?

6 A. Well, you can test each equation. As  
7 Mr. Burke explained earlier, there's a standard error  
8 for each equation, we can test its size. We test the  
9 goodness of fit for each equation as it's estimated,  
10 how well does each equation fit the past data. And for  
11 me the most important test for the model like that is  
12 to split the historical sample and test against it.

13 If we have, say, 25 years' worth or 30  
14 years' worth of data which we're using to construct the  
15 model, and what you do is say: Okay, I'm going to  
16 construct this model using the first 25 years' worth of  
17 my data, I'm going to use those 25 years to pretend  
18 that I'm back five years ago and forecasting the  
19 succeeding five years, which I already have as history.

20  
21  
22  
23 ...  
24  
25

1 [3:10 p.m.] So, I build the model, use the model to  
2 forecast a history that we already know and see how  
3 well it did, and LISA did well at doing that.

4 Q. Now, you mentioned that there were  
5 certain risks to the economic forecast and you cited  
6 environmental regulations as one of those risks.

7 And do I understand it correctly that the  
8 gist of your comment was that tighter environmental  
9 regulations translate into the scenario where more  
10 resources are consumed and the end result is you have a  
11 better environment, a better natural habitat, but it  
12 doesn't do anything to your GDP?

13 A. That's correct.

14 Q. So, can I take from that that while  
15 tighter environmental regulations - while, we agree  
16 that that could be a very good thing - the result is  
17 that it imposes less efficient processes on the way  
18 electricity is consumed?

19 A. Not in all cases, but in general,  
20 yes. In most cases, I would say yes.

21 Q. So, it would be fair to say that it  
22 is less efficient because more energy is required to  
23 get to the same output?

24 A. To the same measured physical output,  
25 yes. There may be cases in which an environmentally

1 more benign process also is more efficient. But in  
2 most cases, if we are talking about end-of-the-tailpipe  
3 kind of regulation, that uses resources and doesn't  
4 produce additional measured output.

5 Q. And if the provincial government or  
6 the federal government were to impose a lot tougher or  
7 just tougher, generally more tighter environmental  
8 regulations, what does this do to your load forecast or  
9 your forecast for demand?

10 A. As I said in my evidence in-chief, if  
11 such tighter regulations were in the order of a  
12 continuation of past trends, it wouldn't have a  
13 significant negative impact on our economic forecast  
14 because our forecast implicitly takes such past trends  
15 already into account.

16 But if such regulations were to be a  
17 significant break from past trends, then that might  
18 have a negative impact on our forecast and it could be  
19 a significant negative impact on our forecast.

20 MR. BURKE: A. Excuse me, I might just  
21 add that what Mr. Rothman is talking about is the  
22 impact on GDP. Translating the impact on GDP into load  
23 is not a direct process. Certainly, if the effect was  
24 to lower GDP for the province, it might as a direct  
25 effect reduce electricity demand, but it depends how

1 the environmental regulations are met and how industry  
2 restructures to cope with a cleaner environment.

3 It is not clear in advance whether  
4 electricity's market share would increase or decrease  
5 in the course of attempting to meet environmental  
6 regulations.

7 We would have to have something much more  
8 specific to work with to assess what the impact on  
9 electricity consumption itself would be.

10 Q. Mr. Rothman, you also spoke about  
11 cost escalators and you said that Hydro has an  
12 industrial cost escalator model, I believe.

13 MR. ROTHMAN: A. Yes.

14 Q. Could you describe that for me,  
15 please?

16 A. Well, it is not a single model. We  
17 have a set of computational methods by which we  
18 forecast escalation rates for Hydro specific cost  
19 indices. As I said, each of those is really a  
20 computational technique that is used to build up the  
21 cost escalator from escalation forecasts for the inputs  
22 to that activity.

23 Q. So, how does this industrial cost  
24 escalator model, how does that fit into the long-term  
25 forecast?

1                   A. That is typically done well after the  
2 long-term forecast, a month or so after the long-term  
3 forecast.

4                   It uses the inflation rate from the  
5 long-term forecast to drive a model of one of our  
6 suppliers, DRI. They have an industry cost model and  
7 we put our inflation rate forecast into DRI's industry  
8 cost model. From that, we get forecasts of industry  
9 cost indices. We use those industry cost indices as  
10 cost indices for the materials, the components of the  
11 baskets for each of the escalators that we compute.

12                  Q. So, you get your long-term economic  
13 forecast determined; then you determine these cost  
14 escalators?

15                  A. Yes.

16                  Q. And do you use that cost escalator  
17 data for a future long-term forecast? Is that where  
18 the benefit comes in?

19                  I am just not sure where the data for  
20 this cost escalator, how that fits into the long-term  
21 economic forecast if it is being used after the  
22 long-term forecast has been completed.

23                  A. The cost escalators are an end  
24 product. Once we produce the cost escalators, we don't  
25 put them back into any of our forecasts.

1                   Cost escalators are an end product given  
2                   to internal customers within Ontario Hydro. They are  
3                   used for future cost calculations by engineers and  
4                   others responsible for costing future projects within  
5                   Ontario Hydro.

6                   Q. How long have you been using this  
7                   process to estimate cost escalators?

8                   A. I think we went to the DRI model  
9                   about four or five years ago. Before that, we were  
10                  doing our own forecasts of some Statistics Canada  
11                  series.

12                 Before that, we had some attempts to make  
13                 these forecasts on the basis of internal Hydro  
14                 purchasing data, but that proved to be much too  
15                 difficult and it was much easier to use the Statistics  
16                 Canada series as proxies for specific things that  
17                 Ontario Hydro does buy.

18                 Q. Over the course of the past four or  
19                 five years since you have used this method for the cost  
20                 escalators, have you gone back to check how your  
21                 figures compared with actuals over that time?

22                 A. I don't think that we have done any  
23                 systematic comparisons of our escalated cost series  
24                 with actuals; and the reason is that it is very  
25                 difficult to get the actuals to check.

1 Q. Why is that?

2 A. Because too many things change in the  
3 interim between what was contemplated as a particular  
4 activity five years ago and what is contemplated now.  
5 And for our particular input series, for particular  
6 pieces of equipment, there simply isn't a robust enough  
7 purchasing cost data base to be able to make valid  
8 comparisons.

9 Q. Okay. I don't think you have to turn  
10 to it, but in Exhibit 15, you are talking about the  
11 long-term economic outlook and sources of economic  
12 growth for Ontario.

13 Hydro is basically predicting a slowdown  
14 in the growth averaging roughly 1.1 per cent between  
15 1980 and 2015 as compared with the growth of the 1980s.  
16 It is actually table 1 on page 1 of Exhibit 15.

17 A. Yes.

18 Q. Now, presumably, we entered into the  
19 Free Trade Agreement with the States because it was  
20 seen as a way to improve the economic viability of the  
21 province and to create more outputs.

22 A. Of the country, yes. As you recall,  
23 the province wasn't --

24 Q. I am sorry?

25 A. As you may recall, the provincial

1 government was not a supporter of the Free Trade  
2 Agreement.

3 Q. But certainly, I can recall the Prime  
4 Minister travelling back and forth the country, and  
5 particularly in Ontario, saying how this would be a big  
6 thing for Ontario as well, given our industrial base  
7 here and our proximity to the U.S. markets. I am not  
8 saying he was right in that, but I am saying, certainly  
9 that was the line he was promoting?

10 A. Yes, and it was our estimate that it  
11 would also be positive for the economy of Ontario.

12 Q. Now, with that - and it was in a  
13 response to Interrogatory 1.6.47 - and I didn't provide  
14 you with a copy of that, because I believe that that  
15 was one of the interrogatories that Mr. Campbell had  
16 included in his documents, but -- actually, let me just  
17 pull that out.

18 And actually, it was page 3; actually,  
19 iii. And it states there that:

20 "By 1998, real GDP is expected to rise  
21 by approximately 3 per cent and the total  
22 increase in load is predicted by 3.14 per  
23 cent."

24 And this study was done in 1988, I  
25 believe. Is this the latest work that Hydro has done

1 in terms of the impact of the Free Trade Agreement on  
2 Ontario?

3 A. Yes, it is the latest full analysis  
4 that we have done.

5 Q. Have you got any reasons to believe  
6 that this, that figure that I just quoted, should  
7 somehow be changed or altered, or does it remain  
8 applicable to date?

9 A. As I said in my evidence in-chief, I  
10 think that subsequent events have put that in some  
11 jeopardy, but no, I do not change it yet.

12 Q. Now, Exhibit 15, you talked about the  
13 Free Trade Agreement, and you said with respect to that  
14 agreement:

15 "Ontario's largest industries are  
16 expected to be quite cost-competitive and  
17 the economy will tend to specialize more  
18 in industries in which it is already  
19 strong."

20 Do I take it that that view still holds  
21 today?

22 A. Yes. Do you have a page reference  
23 for that quotation?

24 Q. Page 4 of Exhibit 15.

25 Now, AMPCO asked an interrogatory,

1 1.24.11, and it was provided with a copy of a document  
2 called, 'Ontario Manufacturing Competitiveness Relative  
3 to the United States.'

4 And on page 14 of that document - and I  
5 just want to read part of the paragraph for the benefit  
6 of the people that don't have a copy of it - it states  
7 on page 14:

8 "Among the nine selected sectors, the  
9 areas in which Canada appears to have  
10 sustained comparative advantage in total  
11 unit costs are primary metals and  
12 transportation equipment.

13 "Furthermore, both of these sectors  
14 improved their relative standing quite  
15 noticeably during the last 15 years.

16 "For these industries, the cost and  
17 trade measures all point in the direction  
18 of strong competitiveness.

19 "The least competitive sectors using a  
20 TUC criterion - and that is total unit  
21 cost criterion - are food and beverages  
22 and electrical products and petroleum and  
23 coal products."

24 Now, I wonder if you could turn to chart  
25 1.4 on Exhibit 15. Chart 1.4 is about halfway

1 through --

2 A. You mean Table 1.4.

3 Q. I'm sorry, Table 1.4, yes, entitled,  
4 'Ontario Industrial Structure.'

5 A. Yes, I have it.

6 Q. So, as I say, in this last report,  
7 you are saying which industries are going to do well  
8 and which aren't.

9 Now, if you look down under the  
10 manufacturing column and you look to transportation and  
11 equipment, which I take it that to mean automobiles; is  
12 that correct?

13 A. Primarily automobiles. It includes  
14 aircraft manufacturer or bus manufacturer, locomotives,  
15 those kinds of things. I am not sure whether  
16 snowmobiles are in there or not.

17 Q. Okay. And if we look along the line  
18 of figures for transportation equipment, we see that it  
19 is anticipated to increase its share of provincial GDP  
20 from 4.7 per cent in 1990 to 5.5 per cent in 2015.

21 A. Yes.

22 Q. So, that prediction is certainly in  
23 accords with the report I referred to earlier, on the  
24 competitiveness with the U.S.

25 If you look at primary metals, which is

1 three lines above that, and which also was predicted by  
2 Hydro to do well with the Americans under the Free  
3 Trade Agreement, you have that sector declining from  
4 1.9 per cent in 1990 to 1.7 per cent in 2015.

5 And if we could look to electrical and  
6 electronic products, which was just below the  
7 transportation equipment, and that was said by Hydro to  
8 be the weakest competitor, and that shows a rather  
9 substantial growth from 3.9 per cent in 1990 to 5 per  
10 cent in 2015.

11 And I was just wondering if you could  
12 explain for me this apparent inconsistency, as to why  
13 the sector which was supposedly the strongest is  
14 declining, and the weakest sector is increasing its  
15 share of GDP.

16 A. The data base from which the document  
17 that you are quoting drew was for events in 1954 and  
18 previously.

19 If you look at the tables here, you will  
20 see that for the majority of the industries there, the  
21 most recent data are 1984; primarily metals is one of  
22 those.

23 And you can see if you look on page 13,  
24 which is the page preceding the one you read from, that  
25 total unit cost ratios for the latest available years,

1 which is what was being relied on there, were all  
2 mid-80s and showed pretty much the pattern as quoted  
3 with electrical products, having a total unit cost  
4 ratio exchange rate adjusted of 1.45 in that table.

5  
6  
7  
8  
9  
10  
11  
12  
13  
14  
15  
16  
17  
18  
19  
20  
21  
22  
23  
24 ...  
25

1 [3:29 p.m.] Now what has happened in the subsequent  
2 years has been that there have been some changes in  
3 relative unit cost ratios in those industries. For  
4 example, in using again a DRI source of unit labour  
5 costs, we find that unit labour costs in electrical  
6 products have actually decreased relative to those in  
7 the United States between 1985 and 1988.

8 Clearly, these numbers are using a  
9 somewhat different measure than did the source that you  
10 quoted, because they showed electrical products as  
11 having lower unit labour costs in Canada than in the  
12 United States in 1984. Nonetheless, it implies that  
13 Canada's competitive position improved in electrical  
14 products between 1985 and 1988.

15 On the other side, primary metals'  
16 competitive position deteriorated significantly,  
17 according to this data base between 1985 and 1988 by  
18 roughly 15 per cent in relative unit labour costs. So,  
19 it is partly that subsequent events have changed the  
20 forecast and have changed the directions of these  
21 industries.

22 I also, and this is -- well, I think that  
23 in some cases here these unit labour cost comparisons  
24 may not be as good indicators of likely export success  
25 as would a more comprehensive look. The document that

1     you have makes the point, quite forcefully, that we  
2     shouldn't look simply at one source of data about how  
3     we expect industries to perform relatively. And that  
4     document looks actually at four different indicators of  
5     trade performance, one of them relating to the results  
6     of the trade performance in the past, and three of them  
7     relating to source factors like relative unit costs.

8             I think the primary metals is a good case  
9     in point. I think that there are aspects of the  
10    primary metals industries in which Canada can continue  
11    to be competitive with industries in the United States,  
12    but several things have happened in the -- well, I  
13    guess it was in the four years since that study was  
14    done, almost four years.

15            One of the things that has happened is  
16    that the United States' primary metals industry, in  
17    particular the United States' steel industry, has  
18    become more productive. They have done that largely by  
19    closing their least productive plants, and alas, their  
20    average productivity has increased.

21            Another thing that has happened is that  
22    wage rates in Canada have increased significantly  
23    faster than those in the United States in the same  
24    industries, which is why the unit labour costs, which  
25    is what I was quoting, not total unit costs, why the

1 unit labour costs have increased so significantly.

2 I think that with some adjustments in  
3 those relatively high rates of wage increase in Canada,  
4 and with some adjustments in the external value of the  
5 Canadian dollar closer to its purchasing power parity  
6 value that these industries will again become  
7 competitive.

8 Q. Well, are the comparative advantages  
9 so unstable that they can change so much in a two-year  
10 period?

11 A. Well, that is what I am saying. I  
12 think that it is not -- first, let's be clear. It is  
13 not a two-year period. You are quoting from, this is a  
14 four-year period that we are talking about now or  
15 almost four-year period. And let's also be clear that  
16 one of the things that's happened over that time has  
17 been a very large change in the external value of the  
18 Canadian dollar.

19 And yes, where you are talking about a  
20 comparative advantage that relates to about a ten per  
21 cent Canadian cost advantage or Canadian cost  
22 differential, and the dollar moves buy ten per cent,  
23 you are wiped out just on the value of the Canadian  
24 dollar.

25 I think that has been a problem for

1 Canadian industries, and as I said in my evidence  
2 in-chief, I think that that is a continuing problem and  
3 has some potential for remaining one. We don't have it  
4 in our forecast as a continuing problem over a long  
5 period of time, because we do think that values will  
6 adjust, but if they don't, that could be a continuing  
7 problem.

8 THE CHAIRMAN: Mr. Rodger, would this be  
9 a good time to take the afternoon break?

10 MR. RODGER: That would be fine, Mr.  
11 Chairman.

12 THE REGISTRAR: Hearing will recess for  
13 15 minutes.

14 ---Recess at 3:36 p.m.

15 ---On resuming at 3:51 p.m.

16 THE REGISTRAR: Please come to order.  
17 This hearing is in session.

18 THE CHAIRMAN: Mr. Rodger?

19 MR. RODGER: Thank you.

20 Q. Mr. Rothman, just if I could go over  
21 one part, just so I understand it, on page 13 of this  
22 document we are looking at connected with this  
23 Interrogatory 1.24.11...

24 THE CHAIRMAN: Is that Exhibit 15?

25 MS. PATTERSON: No.

1 THE CHAIRMAN: Oh, it is the one attached  
2 to the question?

3 MR. RODGER: That is right, Mr. Chairman.  
4 It is page 13 of that document, and it is table 1.8,  
5 "Canada-United States Relative Total Unit Cost Ratios."

6 Q. And with respect to the electrical  
7 products, are you saying now, Mr. Rothman, that you  
8 have recent sent data from DRI for more recent periods  
9 than what this table shows, that indicates that Canada  
10 has a cost advantage in the area of electrical  
11 products?

12 MR. ROTHMAN: A. Part of my problem, Mr.  
13 Rodger, is that we have different definitions of some  
14 of these industries, I think, but yes, I have had --  
15 some recent data indicate that the relative unit labour  
16 costs in electrical products have improved in Ontario  
17 relative to those in the United States over the last --  
18 well, over the period from 1985 to 1988.

19 Now, one of the things that may have  
20 happened there is that the 1987 statement was so  
21 correct about the inability of electrical products to  
22 compete, that the worst of those have gone out of  
23 business in the intervening period, and that what is  
24 left is a competitive set of industries.

25 And similarly, if we look at -- not

1 similarly, going from there to the primary metals  
2 industry, I don't think that the statements that we  
3 have here in fact are contradictory. The primary  
4 metals industries, according to the table that you  
5 quoted, table 1.4 of Exhibit 15, have been losing share  
6 at a fairly rapid pace from 1970 to 1990. As you can  
7 see, their share of Ontario industrial output or  
8 Ontario total output fell by almost half. I commented  
9 on that in my evidence in-chief.

10 But from 1990 to 2015, their share falls  
11 almost not at all. This is in fact due to an  
12 acceleration in their growth, partly because of the  
13 kinds of competitive advantages that were cited in the  
14 1987 study.

15 Q. So you are saying now that primary  
16 metals fell, even though that was one of Ontario's most  
17 competitive industries?

18 A. They didn't fall in absolute terms.  
19 They did not grow as rapidly as did other industries in  
20 Ontario.

21 One of the things that we saw, in fact,  
22 as a potential advantage under the Free Trade Agreement  
23 was that Ontario's primary metal industries, which we  
24 saw then as competitive with those in the United  
25 States, would get, under the Free Trade Agreement,

1 better access to markets in the United States and would  
2 be able to grow more quickly than they had in the  
3 preceding years.

4 Q. So, just to see if I understand  
5 exactly this chart, in this table 1.8, under the  
6 exchange rate adjusted for electrical products in 1986,  
7 that shows 1.45, and I take it that means that if it  
8 costs \$1 in the U.S., it is going to cost \$1.45 in  
9 Canada.

10 A. Yes.

11 Q. We are saying now that there has been  
12 an improvement in electrical products, so should that  
13 figure be less than one now?

14 A. I can't tell you, because I don't  
15 have the data. These are total unit cost numbers and  
16 include both labour and capital costs, the total cost  
17 of producing the good, and this was a major -- well,  
18 this was a more detailed study.

19 The numbers that I quoted you from DRI  
20 are unit labour costs. There is simply some measure of  
21 real level of total output divided by total labour  
22 inputs, and then indexed from one country to another.  
23 So, the total unit cost contained the total cost of  
24 producing the item, whereas unit labour costs are just  
25 labour costs. I can't tell you what has happened to

1 total unit costs in the electrical products industry in  
2 the time since that study was done.

3 Q. Would it be fair to say that you  
4 wouldn't expect that, that 1.45 figure to be less than  
5 1, because that would mean that that sector, electrical  
6 products, would have a 45 per cent improvement, as  
7 compared to the U.S. market, and that would be  
8 notwithstanding that Canada had a very high dollar  
9 during the late 1980s?

10 A. Yes, it wouldn't surprise me. I  
11 agree that -- I would be surprised if there were that  
12 large a change in its competitive position in four  
13 years.

14 Q. So, with these changes that we have  
15 talked about, would it be fair to say that, under the  
16 Free Trade Agreement, the industries which Hydro  
17 expects to do well in terms of competing with the  
18 Americans are primary metals, cars, and electrical  
19 products?

20 A. Those are among the industries.

21 Q. Let me clarify that. Should primary  
22 metals be included in that, since it is going down, it  
23 is decreasing in its percentage of GDP?

24 A. Yes, we expected primary metals to do  
25 well, and we still expect primary metals to do well.

1 As I said, intervening events in the United States and  
2 Canada may have changed the expectation about the  
3 degree to which it will do well, but I still think that  
4 primary metals is an industry that could do well.

5 MR. BURKE: A. Maybe I could just add  
6 here, you are using the composition of the Ontario GDP  
7 to infer something about whether the Free Trade  
8 Agreement confers benefit on the industry. And really,  
9 unless you know whether that industry, its underlying  
10 growth rate was such that its share in 2015 would have  
11 been 1 percent and the Free Trade Agreement might push  
12 it up to 1.9.

13 Given the data that is on the table right  
14 here, you can't really infer anything about what the  
15 Free Trade Agreement has done to the share of the  
16 industry in that forecast.

17 Q. Well, could you tell us then what  
18 your prediction is in terms of which industries will do  
19 well?

20 MR. ROTHMAN: A. Well, I think I made  
21 exactly the same point that Mr. Burke did, which was  
22 that if we look at primary metals as an example, even  
23 with the data on the table, we can see that although it  
24 had lost share rapidly in the preceding 20 years, it is  
25 forecast to lose share but only quite slowly in the

1 next 20 years. And at least part of that pattern can  
2 be attributed to an expectation that that is an  
3 industry that can do relatively well under the Free  
4 Trade Agreement.

5 Q. But in any event, I guess kind of the  
6 bottom line with the Free Trade Agreement is that you  
7 don't expect increases beyond three per cent beyond  
8 1998.

9 A. No, we still expect an aggregate  
10 increase in Ontario GDP of about three per cent by  
11 1988, as a result of the Free Trade Agreement.

12 MR. BURKE: A. '98.

13 MR. ROTHMAN: A. Oh, did I say '88? I'm  
14 sorry, 1998.

15 Q. Now I said earlier on about the Prime  
16 Minister, when we were going through these talks about  
17 free trade with the States, and it was his view at  
18 least, and his government's view, that free trade were  
19 to be a very, very good thing for Canada and for  
20 Ontario. And with that three per cent increase that  
21 you are estimating, that comes out to only three-tenths  
22 of one per cent per year over the next ten years.

23 I guess my question is, is that the best  
24 that we are going to get out of this Free Trade  
25 Agreement, three-tenths of one per cent a year?

1                   A. Actually we forecasted it would be  
2                   negative in the first couple of years, in 1990 and '91,  
3                   and that it would be a little more strongly positive  
4                   than that in the next eight years.

5                   We cut that study off at 1998 just  
6                   because we wanted to take some finite end to it. I  
7                   think that there is certainly every possibility that  
8                   the Free Trade Agreement can continue to provide  
9                   three-tenths of a percent or more over a long period of  
10                  time in annual output levels.

11                 Q. Would it be fair to say that Hydro's  
12                  forecast of the impact of free trade, the benefits, is  
13                  very conservative?

14                 A. I think our estimate of the benefits  
15                  of free trade are pretty close to those of other  
16                  forecasters. I think it is mentioned in the document.

17                 Q. How does it compare with the federal  
18                  government's forecasts?

19                 A. I don't know offhand. We may have  
20                  said it in the document.

21                 Our document suggests that post-agreement  
22                  forecasts of the ultimate increase in Canadian GDP in  
23                  the year 1998, when the agreement is fully implemented,  
24                  resulting from the FTA range from 1.2 to 4.3 per cent,  
25                  that is from the executive summary of the free trade

1 agreement report that was filed with the response to  
2 Interrogatory 1.6.47.

3 So we are in the middle of the range of  
4 the forecasts, and I don't know off the top of my head  
5 which, if any, of that range came from the federal  
6 government.

7 Q. Given the incremental increase of  
8 three-tenths of one percent per year per year until  
9 1998, do you think that the Free Trade Agreement is  
10 worth the dislocation due to the restructuring of parts  
11 of the Ontario economy, if that is all we are going to  
12 get out of this agreement with the Americans?

13 A. The dislocation we were talking about  
14 is about a tenth of a per cent per year, and three per  
15 cent is not inconsequential as an aggregate. Ask Mr.  
16 Burke how much three per cent of load is; it is not  
17 that small an amount.

18 I think if we think of it in the terms  
19 that we put it in our document of getting eleven years  
20 worth of growth in ten years gives some perspective on  
21 what three per cent means.

22  
23  
24 ...  
25

1 [3:05 p.m.] So you ask me whether I think it's worth  
2 it? You're asking me for a value judgment. In truth  
3 that's a political -- ultimately a political judgment.

4 My own value judgment is that, yes, I  
5 think it's worth it. I also am, unlike the Toronto  
6 Star, not inclined to attribute any plant closing that  
7 occurs in Ontario to the Free Trade Agreement.

8 We can readily explain, in fact, the  
9 restructuring that's happening in Ontario as a result  
10 of the kind of factors that I've already talked about,  
11 the relatively high increases in wage rates that have  
12 occurred in Ontario in the last four or five years and  
13 the relatively high value of the Canadian dollar. We  
14 don't need the Free Trade Agreement to account for the  
15 kinds of events that we've seen happening.

16 Q. Would you agree that the inclusion of  
17 Mexico in a Free Trade Agreement would also further  
18 change the dynamics of trade flows in North America?

19 A. Yes.

20 Q. And what I gather from the various  
21 media reports at least, the Prime Minister once again  
22 believes that this is going to be a positive benefit  
23 for Canada and for Ontario. And yesterday I believe  
24 you said that you haven't taken into consideration the  
25 impact of extending the Free Trade Agreement to Mexico?

1                   A. I said that, yes, and we haven't done  
2     it.

3                   Q. Has Hydro undertaken any studies or  
4     any analysis whatsoever on the implications of  
5     extending Free Trade to Mexico?

6                   A. I can't speak for all of Hydro. The  
7     Economics and Forecasts Division has not undertaken any  
8     such study.

9                   Q. Now, yesterday you also said that  
10    Hydro doesn't forecast radical breaks from past  
11    patterns and the forecast is based on the evolution of  
12    the present structure?

13                  A. Yes.

14                  Q. Do you think it's a good idea in a  
15    planning exercise that your economic forecast,  
16    particularly a long-term economic forecast, should be  
17    flexible enough to be able to incorporate changes  
18    whether, although they may not be certain, they're  
19    likely?

20                  A. A good question, and it's one that  
21    I've wrestled with on occasion. The question for me  
22    goes something like -- put it in the context of  
23    environmental regulation: We have a status quo which  
24    includes some trend in environmental regulation.

25                  If I were to believe that that status quo

1 is less likely than some alternative that would involve  
2 tighter regulation, should that go into the forecast;  
3 or does it still remain more likely than any one  
4 particular alternative that I could put into the  
5 forecast, because if I'm going to forecast, I have to  
6 forecast something specific.

7 The something specific, to choose one  
8 example that I talked about yesterday, might be, for  
9 example, full implementation of the federal Green Plan  
10 as now specified.

11 Is that more likely than the status quo,  
12 than continuing on whatever trend there is; or is it  
13 more likely that some variant of that currently  
14 unspecified would be implemented, or something more  
15 stringent than the current Green Plan would be  
16 implemented?

17 For me it's a philosophical problem and  
18 at this point I don't know of any alternatives that I  
19 consider to be more likely than the present one, which  
20 is, that essentially past trends continue.

21 We certainly monitor events like the  
22 publication of the Green Plan and its passage, its  
23 progress through the process of definition and  
24 implementation and discussion with the provinces and  
25 all of the necessary political work that's going to

1 have to go on before it gets implemented, and as it  
2 becomes more clearly defined, and as we can make  
3 estimates about whether some variant of the Green Plan,  
4 some particular variant becomes the most likely, then  
5 we can put that into the forecast.

6 But at this point I don't see any one  
7 alternative that is more likely than the one that we  
8 currently have as our forecast.

9 Q. Earlier on today, your colleagues  
10 were describing how they have a confidence band for the  
11 long-term load forecast. Do you think there's value,  
12 from a planning point of view, of also having a similar  
13 confidence band around the long-term economic forecast?

14 A. Yes, there is, and we have in the  
15 past regularly published bands, but -- at one time we  
16 did publish uncertainty bands, we have discontinued  
17 that publication.

18 Q. Why was that?

19 A. Primarily because it wasn't used.  
20 The named audience for an uncertainty band for the  
21 economic forecast would be the load forecast and it's  
22 developed its own methodology, which works very well  
23 for its purposes of uncertainty estimation, and turns  
24 out to be a good uncertainty band for the economic  
25 forecast.

1 Q. So from that I take it that, at  
2 present, Hydro has no future plans to try and  
3 incorporate some kind of a band width around their  
4 long-term forecasts?

5 MR. BURKE: A. I just might add that the  
6 GDP band that we prepared for the load forecast was  
7 discussed with the people in the economic forecast area  
8 as well as the external -- using the results of that  
9 external economic forecast advisory committee, so that  
10 I believe they would endorse the band that we use for  
11 GDP.

12 The document that Mr. Rothman is  
13 referring to used to provide what were called  
14 prediction ranges for a wide number of economic  
15 variables and really, as he says, there was little use  
16 for most of those numbers in practice, except for the  
17 numbers -- for the variables that the load forecast  
18 itself uses.

19 Q. Now, this next issue came up very  
20 briefly yesterday during your testimony, Mr. Rothman,  
21 but can you tell me the assumptions that were made in  
22 the long-term economic forecast regarding changes in  
23 Canada's Confederation and particular reference to  
24 Quebec, the situation there?

25 MR. ROTHMAN: A. We made no assumptions

1 about such changes for the long-term forecast.

2 Q. But you do -- in Exhibit 15, you do  
3 discuss the idea that it is possible to model scenarios  
4 of what might happen, what the impact might be.

5 I think, for example, that one scenario  
6 you identified in Exhibit 15 if Quebec were to separate  
7 would be a lower Canadian dollar and, therefore, it's  
8 affecting demand because the dollar would mean more  
9 exports and perhaps more businesses starting in Ontario  
10 and so forth.

11 So it is possible to do simulations at  
12 least; would you agree?

13 A. Yes. What we said in the Exhibit 15  
14 was that:

15 "Political instability resulting from  
16 problems with Confederation could lead to  
17 higher inflation in Canada and a lower  
18 Canadian dollar."

19 When I talked yesterday, I had suggested  
20 that these kinds of instabilities would be likely to be  
21 temporary depending, at least in part, on uncertainty  
22 and that when the uncertainty was resolved one way or  
23 another we would not necessarily expect a long-term  
24 effect.

25 There could, of course, be a long-term

1 effect if there were a long-term effect on Canada as a  
2 whole, or on the structure, and on the underlying  
3 values of the Canadian dollar.

4 THE CHAIRMAN: What page are you reading  
5 from on Exhibit 15?

6 MR. ROTHMAN: Page 6. And I did say that  
7 we can simulate those impacts. We have not done so  
8 but, as I suggested, I know of at least two other  
9 forecast suppliers who are planning to or are in the  
10 process of simulating the consequences of Quebec's  
11 separation or a major constitutional change. They  
12 haven't finished yet.

13 MR. RODGER: Q. And will Hydro be taking  
14 those forecasts into consideration when --

15 MR. ROTHMAN: A. Well, that is another  
16 one of the kind of philosophical questions that we get  
17 into.

18 Even if I were to think that there is a  
19 less than 50 per cent probability that the current  
20 Canadian constitutional structure will persist into the  
21 long run, if -- in order to change the forecast, I  
22 would have to have some other constitutional structure  
23 that is more likely than the present one, and while the  
24 whole range of possible other constitutional structures  
25 might be more likely than the present one, it's

1 difficult to pick one of them.

2 And so I think the appropriate way to  
3 handle it is essentially the way that we're going,  
4 which is, to try to get some quantification of what the  
5 impacts might be of particular other structures in  
6 order to be able to give that information to Mr. Burke  
7 and to others within the corporation, but not  
8 necessarily to incorporate it into the forecast itself  
9 until we have better information about a particular  
10 structure to incorporate.

11 Q. When you're planning for a long  
12 period of time like Hydro is doing in this DSP, and you  
13 recognize that there are certain -- there are  
14 uncertainties--

15 A. Yes.

16 Q. --there's no doubt about that, but is  
17 it also an objective when you're long-term planning to  
18 try, as best as you can, to avoid surprises in your  
19 long-term forecasts?

20 A. Yes.

21 Q. And while we don't know exactly  
22 what's going to happen with Free Trade with Mexico or  
23 with Quebec, we certainly know that those are issues  
24 that are out there, they're real, and it's likely that  
25 there is going to be real changes as a result of those?

A. I agree. And the question that -- you say we should avoid surprises, and I agree with that.

And the reason that we have stopped doing prediction ranges for the economic forecast and have intensified our efforts and sharpened our methodology for uncertainty ranges in the load forecast is that it's in the load forecast where the corporation's vulnerability to uncertainty is most clearly placed. So that's where we have put our efforts, in uncertainty on quantification.

The other variables -- uncertain forecast variables which are important for the corporation are the financial ones; our interest rates and the value of the Canadian dollar, because the corporation is a major borrower on the U.S. and the Canadian markets, and so a large fraction of its costs relate to those financial markets.

So although we can stop publishing the prediction ranges, we continue to publish, on a regular basis, alternative financial scenarios for the use of the Treasury Division in formulating their financing strategies and in managing the existing debt.

...

1 [4:19 p.m.] Q. Well, maybe it is a good time to  
2 start and talk about interest rates and the Canadian  
3 dollar.

4 If I could ask you to turn -- it is  
5 Exhibit 15 and it is Table 1.1. The heading is  
6 'Forecast Tables'. There's actually three tables,  
7 forecast tables: 1.1 is Ontario; 1.2 is Canada; and  
8 1.3 is the United States.

9 Now, if you go to Table 1.2, that shows  
10 the inflation rates between Canada and the U.S. I am  
11 sorry, 1.2 is the inflation rates in Canada. And in  
12 the 80s, I am suggesting that the inflation gap between  
13 Canada and the U.S. was approximately 1.25 per cent; is  
14 that fair?

15 A. It might have been a little bit  
16 larger than that, in fact, but that is fair.

17 Q. Okay.

18 A. If you take the Consumer Price Index,  
19 you don't see the GDP deflator in yourself, which is a  
20 better measure.

21 Q. All right. So we have a 1.25 or  
22 slightly higher inflation gap in the 80s.

23 For the 90s, Hydro is predicting that the  
24 inflation rate between Canada and the United States  
25 will be the same, at 5 per cent; is that correct?

1                   A. Again, in terms of the CPI, it looks  
2                   like the first five years of this forecast are half a  
3                   per cent lower for the U.S. than for Canada, and then  
4                   the same.

5                   Q. Then the same.

6                   Now, if, on Table 1.3, you look to the  
7                   bottom of that table, and it talks about the Canada,  
8                   U.S. interest differentials.

9                   During the 80s, it shows that the  
10                  long-term interest rate gap was about 1-1/2 per cent;  
11                  that is, Canada's rates are 1-1/2 per cent higher than  
12                  in America.

13                  Now, my question is: If Hydro is  
14                  predicting that the inflation rates between Canada and  
15                  the United States are going to be the same in the long  
16                  term, why are interest rates in Canada expected to be  
17                  higher, which is also seen in Table 1.3?

18                  A. Because Canada's interest rates have  
19                  always been higher than those in the United States.  
20                  Canada is a relatively less capital intensive country  
21                  and so has higher capital productivity in general and,  
22                  therefore, higher interest rates.

23                  Q. But isn't that based on the fact that  
24                  our inflation rate has been higher in the past?

25                  A. Let's differentiate, if we can,

1 between nominal and real interest rates. Canada's  
2 nominal interest rates have been higher, varying on the  
3 basis of inflation rates; and that is so that when  
4 Canada has had higher inflation rates, you could expect  
5 Canada to have higher nominal interest rates.

6 But in general, Canada has also had  
7 higher real interest rates than the United States for  
8 the reason that I mentioned, and that is what this  
9 forecast is suggesting.

10 Q. In the 1990s then, Canada is still  
11 going to have an interest rate difference. We are  
12 going to be 1-1/4 per cent higher roughly.

13 Does that reflect our capital  
14 productivity differences between Canada and the U.S.?  
15 Is that the reason for the higher interest rates here?

16 A. That is what produces long-run higher  
17 differentials in interest rates.

18 Q. Now, staying with those same tables  
19 with respect to the Canadian dollar, during the 80s,  
20 the Canadian dollar stayed high even though we had a  
21 higher inflation rate and a higher interest rate than  
22 the United States.

23 A. Even though we had a higher interest  
24 rate because we had a higher inflation rate -- sorry,  
25 even though we had a higher inflation rate because we

1 had a higher interest rate.

2 Q. And notwithstanding the prediction by  
3 Hydro that the inflation rate between Canada and the  
4 United States is going to be the same in the long term,  
5 Hydro is still predicting from table 1.2 that the  
6 Canadian dollar is going to drop below 80 cents U.S.

7 A. Because interest rate differentials  
8 narrow.

9 Q. Do they?

10 A. Sure. Look at the short-term  
11 interest rate differentials; they narrow consistently  
12 throughout the forecast. They are forecast at an  
13 average of 2.8 per cent in the first five years of this  
14 forecast, 1991 to '95, narrowing to 1.3 per cent for  
15 the last five years of the forecast, 2011 to 2015.

16 Q. So, what is the reason why the  
17 Canadian dollar is supposed to be lower in your  
18 forecast? What is the reason for that?

19 A. As I just suggested, short-term  
20 interest rates narrow and the Canadian dollar falls.

21 Q. Although isn't it true that for some  
22 years now Hydro has been predicting a dollar below 80  
23 cents, particularly for the last five years at the rate  
24 hearings and that hasn't been the case.

25 A. We have said for some time that the

1 Canadian dollar can stay off, above or below its  
2 purchasing power parity value, depending primarily on  
3 short-term money market phenomenon.

4 This has been a relatively long period of  
5 departure from the Canadian dollar's underlying value,  
6 which we believe to be under 80 cents at the present  
7 time.

8 And it stayed up there because there has  
9 been persistent and consistent tight monetary policy in  
10 Canada keeping interest rates high, keeping the value  
11 of the dollar high.

12 I said that that has had some negative  
13 consequences for the Canadian economy, but that is what  
14 has happened over the last, as you suggest, several  
15 years.

16 MR. RODGER: Mr. Chairman, I am about to  
17 start a new section of cross-examination. If you would  
18 like, I could start it. Or I don't know if you want to  
19 break today?

20 THE CHAIRMAN: Well, we could go for  
21 another 15 minutes if you like.

22 MR. RODGER: Okay.

23 Q. I would like to turn now to your  
24 demographic forecast and the household formation.

25 And you said yesterday that the

1 demographic forecast was important because it has an  
2 impact on various aspects of the economic forecasts  
3 such as household formation and housing stock.

4 MR. ROTHMAN: A. Yes.

5 Q. Now, AMPCO asked an interrogatory,  
6 1.24.9, which I would ask you to turn to, please.

7 And this table shows a comparison of population  
8 forecast for Ontario by age groups and it compares  
9 predictions by Statistics Canada, Ontario Treasury in  
10 Economics and Ontario Hydro.

11 And if you look down to the bottom sets  
12 of figures under the heading, 'year 2011' -- oh, I am  
13 sorry.

14 Do you not have it?

15 A. I have it.

16 Q. If you look down to the bottom chart,  
17 the bottom set of figures at the heading, 'year 2011,'  
18 I want to ask you about some of the totals for Hydro's  
19 predictions.

20 For 2011, the Stats Can forecasts 6621.2  
21 under 45, for age groups under 45, and 5222 over 45.

22 And Hydro's numbers are 7233 under the  
23 age of 45 and 4830 over 45. So, Hydro's difference is  
24 roughly 612,000 people will be under 45 than the other  
25 forecasts. And I am wondering, what is the reason for

1 those differences?

2 A. I am sorry, you are aggregating the  
3 numbers that are here?

4 Q. Yes. I am adding up from zero to 44  
5 StatsCan's figures and for Hydro's figures, which is  
6 the under 45 age group, and then I am adding up  
7 StatsCan's figures for 45 and up and Hydro's figures  
8 for 45 and up. And the difference is that Hydro is  
9 saying that there will be 612,000 people under 45 to a  
10 greater extent than what the StatsCan predictions are.

11 I guess I am asking, what are the factors  
12 that come into play here? Why your figures are  
13 different than StatsCan's population?

14 A. Well, to be quite honest, I don't  
15 know. As I explained yesterday, our population for  
16 forecasts are built up from our demographic model.

17 The best guess I can make is that we  
18 had -- you will notice that we have about 200,000 more  
19 people in Ontario than does StatsCan in their forecast.

20 I can only guess at this point, because I  
21 don't know the sources of these differences, that one  
22 of the sources of the differences is our immigration  
23 forecast; and that we have forecast more young people  
24 to immigrate. So that we have a lower age profile than  
25 does StatsCan, because we have a higher assumption of

1 immigrants as a proportion of the population and we  
2 have a low age profile for the immigrants.

3 I would have to consult with my staff to  
4 confirm that that is the reason.

5 Q. The reason I pick it up is that it is  
6 a significant factor, because it will have an ultimate  
7 impact on the demand, because if you have more younger  
8 people, it will create more households, more residences  
9 than do older, an older mix of people.

10 A. Yes, it does create more households.  
11 And the new - the 1990 forecast does have more  
12 households than did the earlier one, though not in  
13 proportion because one other thing that happens is  
14 that - what has been happening with the domestic  
15 population is that the number of people per household  
16 has been falling.

17 And again, as we get more immigrants, the  
18 number of people per household would tend to be higher  
19 than with the domestic population. And so, the number  
20 of households has not risen in proportion to the  
21 population with the higher population forecast.

22 ...

23

24

25

1 [4:34 p.m.] Q. Could you tell me what kind of  
2 elements are in the service sector? What entities make  
3 up that group?

4 A. I'm writing a note. Excuse me just  
5 one moment.

6 The service sector is composed, as I said  
7 in my evidence in-chief, of the wholesale and retail  
8 trade sectors; trade industries of finance, insurance  
9 and real estate; construction -- sorry, not  
10 construction; personal, business and community  
11 services; government.

12 Q. It might be helpful if you could turn  
13 to Exhibit 15, table 1.4.

14 A. Oh, yes, I left out transportation  
15 and communications.

16 Q. Maybe you could just tell me, go down  
17 that list under the services and just describe, what  
18 all makes up transportation?

19 A. That would be all transportation  
20 services. It would include rail, water, air, land  
21 transport by truck, all the commercial transportation  
22 services.

23 It would not include, of course,  
24 individuals driving themselves in their own cars, but  
25 it would include any hired transportation service. It

1 would certainly include over-the-road truck transport,  
2 rail transport, water transport and air transport. I  
3 am not sure whether it would include things like taxis  
4 and in-town courier services. I don't know the details  
5 of that industrial classification well enough. I would  
6 suspect that it does, but I would have to check to be  
7 sure.

8 Q. How about the wholesale?

9 A. Wholesale trade?

10 Q. Yes.

11 A. Just what it says, wholesale trade;  
12 wholesale distribution of various kinds of goods.

13 Q. You said for finance, it is banks and  
14 trust companies?

15 A. There is more than that. That is  
16 finance, insurance and real estate. It would include  
17 the banks and trust companies, insurance companies. It  
18 would also include real estate operations. So that the  
19 large real estate developers would be categorized under  
20 finance, insurance and real estate. It includes the  
21 administration of office buildings, for example.

22 Q. And business and personal?

23 A. That is a wide range of services. It  
24 would include business services like graphic design,  
25 copying services, those kinds of things, to engineering

1 services, consultation, consulting services, accounting  
2 services, law.

3 I can see Mr. Campbell approves of law,  
4 being included as a...

5 MR. B. CAMPBELL: I have to see what  
6 happens, happens to the share, but...

7 MR. ROTHMAN: I can see that he approves  
8 of legal services being counted as a contributor,  
9 positive contributor, to the gross domestic product.

10 Other business services of that kind.

11 Personal services would include things  
12 like barber shops and other personal kinds of services.

13 MR. RODGER: Q. And I take it that  
14 public administration are things like government,  
15 hospitals, universities, colleges, so forth?

16 MR. ROTHMAN: A. Public administration  
17 would include education. I don't think it includes  
18 hospitals, which I think are included under business  
19 and personal services. Health care anyway is included  
20 under business and personal services.

21 Oh, it may be that doctors are included  
22 under business and personal services and hospitals  
23 under public administration. I think that is the way  
24 it goes.

25 Q. Now the reason this service sector is

1 so important, if I understand your comments yesterday,  
2 is that the growth in this service sector is the  
3 principal driver in the stock of commercial floor  
4 space, and hence commercial demand of electricity?

5 A. Yes, that is correct.

6 Q. If we look at table 1.4, we see that  
7 there is an increase in the sector from 50.1 to 50.6, 5  
8 from 1970 to 1990, and...

9 A. 56.5, yes.

10 Q. Sorry, 56.5. And that Hydro is  
11 forecasting an increase in the sector to 59.1, 2015.

12 A. Yes. Remember again, Mr. Rodger,  
13 what this table is. This is a table of shares, not of  
14 absolute levels. So that when something is shown here  
15 as increasing, it simply means that it is increasing  
16 faster than the Ontario economy as a whole. If it is  
17 shown here as decreasing, it may be because it is  
18 decreasing absolutely, or because it is decreasing its  
19 share of Ontario -- the Ontario economy as a whole.

20 Relatively few industries are actually  
21 decreasing in absolute output levels. The one that  
22 comes most easily to mind is tobacco, but most other  
23 industries are forecasting continuing to grow.

24 Q. Am I right, when in your long-term  
25 forecast there is a tie between the business and

1 personal services with manufacturing?

2 A. There is some tie. It is not as  
3 close as -- within the mining sector, for example,  
4 there is actual, one of the subindustries within the  
5 mining sector, mining industry, is services to mining.  
6 That is an industry that is clearly closely tied to  
7 mining.

8 The business and personal services as a  
9 whole, that suggested it includes a lot of services  
10 that are not directly tied to business, but it does  
11 include some, many that are. So yes, it would be tied  
12 to business activity.

13 Q. What do you account the long-term  
14 growth in the business and personal sector? What do  
15 you attribute the growth to?

16 A. As I suggested in my evidence  
17 in-chief, in part to reclassification of some  
18 activities. That is, moving some kinds of services  
19 from within a business, especially a manufacturing  
20 business, to outside of it. Like some consulting  
21 services, even such things as payroll services, for  
22 example, which might move out of the business, the  
23 firm, into an outside firm specializing in that  
24 business, providing those services to the firm. Same  
25 amount of activity takes place, but it gets

1 reclassified from the manufacturing sector to the  
2 service-producing sector. That is one factor.

3 Another factor is simply the growth in  
4 the demand for services, as income rises and people  
5 choose to consume more services, choose to use services  
6 so that they can consume more leisure time. One of the  
7 things that you want, that people want typically as  
8 they get wealthier, is to have more time to themselves.  
9 And one way you do that is to buy services instead of  
10 providing them to yourself in your own household.

11 Another reason for that growth in  
12 services is the growth of two-income families, who  
13 again demand outside services, which they no longer are  
14 providing to themselves. So things like laundry, for  
15 example, dry cleaning would be in those services  
16 categories as well, personal services category.

17 Q. But the business and personal  
18 services that are tied to manufacturing, can they be  
19 seen to also contribute to that growth? Because from  
20 yesterday's evidence, from one of the overheads you put  
21 on, it showed an overall decline in manufacturing over  
22 the long term.

23 A. A very slight decline in  
24 manufacturing. The share of manufacturing, as I said,  
25 as the overhead showed, is really very stable.

1 THE CHAIRMAN: Could we stop now, Mr.  
2 Rodger, and continue tomorrow?

3 MR. RODGER: That is fine, Mr. Chairman.

4 THE CHAIRMAN: Will you continue this  
5 part? Is that what you intend, before Mr. Mark begins?

6 MR. RODGER: Yes, that is correct. I  
7 don't expect to be any more than about 30 or 40 minutes  
8 tomorrow.

9 THE CHAIRMAN: So we will start tomorrow  
10 by completing this part of yours, and then Mr. Mark  
11 will ask his questions, and then you will resume asking  
12 your second--

13 MR. RODGER: That is correct.

14 THE CHAIRMAN: --on the load.

15 MR. RODGER: Long load forecast, that is  
16 correct.

17 THE CHAIRMAN: We will adjourn until  
18 tomorrow morning at 10:00 o'clock.

19 THE REGISTRAR: Hearing will adjourn  
20 until 10:00 o'clock tomorrow morning.

21 ---Whereupon the hearing was adjourned at 4:44 p.m. to  
22 be resumed on Thursday, April 25, 1991 at 10:00 a.m.

23  
24  
25 BD/JB/RT [c. copyright 1985]





